IMPACT OF GENETICALLY MODIFIED (GM) FOOD LABELING SYSTEM ON FOOD MANUFACTURERS IN HONG KONG

by

LAM LAI MING, REGINA
林麗明
TANG OI TAI
鄧愛弟

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APPROVAL

Name:	Lam Lai Ming Regina
	Tang Oi Tai Esther
Degree:	Master of Business Administration
Title of Project:	Impact of Genetically Modified (GM) Food Labeling System On Food Manufacturers in Hong Kong

Name of Supervisor: Dr. Terence Tsai

Signature of Supervisor: 

Date Approved: 3 May 2002

ABSTRACT

Much of the international controversy about Genetically Modified (GM) food surrounds the labeling policies. Countries around the world have chosen different policies to label GM food. The controversy about the Genetically Modified (GM) food in Europe has been quickly picked up in Hong Kong. Since then, many debates have started about genetically modified food products and its labeling system in Hong Kong. In 2001, this issue became an agenda item in meeting folders of the Legislative Council. The pressing question for the Hong Kong regulatory authority is whether or not to implement a labeling system for GM food and GM organisms and whether a voluntary or mandatory labeling system should be introduced.

This paper sets out a number of factors that should be taken into account in determining a labeling system for GM food in Hong Kong. The pros and cons of GM food labeling policies in different countries were examined. A survey was also conducted and the results of the study will be presented in the later sections of the paper. In the survey, 287 questionnaires were collected from Hong Kong citizens. It examines the knowledge, awareness, perceptions and buying behavior of Hong Kong's general public towards GM Food and its labeling system. It is aimed to seek views from the general public on the major components of a labeling system and on the option that should be adopted in Hong Kong. Significant concerns of the general public regarding GM food products and its labeling system were identified. The

results of our study indicated that the majority of the public is in support of the introduction of a mandatory labeling system. It also demonstrated that age and education level are factors which related to people's awareness and perception of GM food.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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CHAPTER I

INTRODUCTION

Modern biotechnology has made it possible to alter the genetic make-up of living organisms by means other than traditional selective breeding. Scientists are able to extract DNA (Deoxyribose Nucleic Acid) from any organism to isolate a specific gene for transfer to another organism. Genetic modification, or GM, uses modern biotechnology to identify the gene coding for desired characteristics and moves the gene from a living organism where it occurs naturally to another living organism in which the characteristics are desired (The Economist; Jun 1999).

Genes and GM Foods

Genes are made of DNA. A gene is a unit of hereditary material, which carries the information to produce protein that determines the characteristics of an organism. Plants and animals, from which foods are derived, have thousands of genes in their cells. By definition, genetically modified foods contain genes or parts of genes from other organisms, whether plant, animal or microbe (Bailey and Bolduan, 2001). This can be done by scientists using modern biotechnology to change food crops by introducing a copy of a gene for a specific trait.

Examples of GM food available on the market

GM foods available on the market come in many different forms. Some are whole foods such as soybean, corn and tomato, but most of them are processed foods like corn chips, tofu, and soymilk. The characteristics of the GM food currently available on the market are similar to their traditional counterparts. At present, about 50 kinds of crops for food purposes, such as Soya Bean, corn and canola, have been genetically modified. Insect resistance and herbicide tolerance are the most common traits introduced into these crops. Appendix 1 shows the most common GM food products that are available in the worldwide market. Appendix 2 shows the major differences between genetic modification and traditional breeding.

Potential Benefits and Risks of GM Foods

1. Increase yield production and nutritional value

GM foods have the potential to contribute to the solution of food insecurity and malnutrition, especially in developing countries. The addition of certain genes to other species can confer resistance to insect, fungal and viral pests; as a result, it can enhance yield production of plants (Monsanto 1997). Genetic modification can also foster herbicide-resistance for plants; therefore, weeds can be selectively killed among standing crops. Increases in yield production can in turn reduce prices. Other benefits of genetic modification technology include enhancing a crop's nutritional

value and increasing more desirable traits in crops. Thus, it may be possible to provide good nutrition at low cost to world populations through GM food technology.

2. Effects on Human Health

As far as GM foods are concerned, knowledge about the full health and environmental effects is incomplete. There is no scientific or medical evidence to date to suggest that GM food is unsafe for human consumption. The health effects of foods made from GM foods depend on the specific content of the food itself and may be potentially beneficial or occasional harmful to human health. For example, a GM food with a higher content of digestible iron is likely to have a positive health effect if consumed by iron-deficient individuals. Alternatively, there is concern that once foreign genes are inserted into a particular food, they may disturb the chemical functioning of that food. This could produce unforeseen health risks in the form of new allergens and toxins (Gwin, 2001). The transfer of genes from one species to another may also transfer allergic risk, and these risks need to be evaluated and identified prior to commercialization. Individuals allergic to certain nuts or eggs, for example, need to know if genes conveying these traits are transferred to other foods such as soybeans. This is a particular problem if the new gene is derived from foods that commonly cause allergic reactions, such as milk, eggs, fish, crustacea, mollusks, tree nuts, wheat and legumes (especially peanuts and soybeans). These foods account for some 90 percent of food-based allergic reactions. (Bailey and Bolduan, 2001) There is also some concern as to the potential health risks from the use of antibiotic resistance markers in GM foods. In addition, genetically modified food may raise cultural and religious concerns by certain group of consumers such as vegetarians.

3. Environmental Hazards

(i) Herbicide, insect and virus resistance

The growing GM industry impacts the overall environment by introducing imbalance into the ecosystem. For example, many GM crop varieties are pest resistant or herbicide tolerant. The effect is that weeds and insects are conferred resistance as well, and viruses develop new resistant strains, requiring ever more chemicals to be used. This might result in extensive damage to the environment (Goldberg, 2000)

(ii) Genetic pollution

There is also a fear that GM could lead to genetic pollution. While there may be no positive evidence of this yet, it cannot be said that there are no risks. Due to cross pollination whereby pollen from GM crops spreads to non-GM crops in nearby fields, there may be potential ecological risks such as increased weediness (Barnett and Gibson, 1999). This may allow the spread of traits such as herbicide-resistance from genetically modified plants to non-target plants, with the latter potentially developing into weeds. There also may be a risk to non-target species such as birds and butterflies (Burrill, 1999). Appendix 3 summarizes the potential benefits and risks of GM Foods.

Scientific Evidence for the Safety of GM Food

Up to now, no scientific evidence had shown that GM foods are unsafe for human consumption. Supporters for the GM technology argue that it is not true to claim that foods from conventional breeding are safer than those produced by GM technology. For example, some potatoes, which are bred by conventional technology, actually contained dangerously high level of solanine (Thorn, 2001). Furthermore, it was argued that "any potential problem (of GM food) was a function of picking what gene to splice; meaning there is nothing intrinsically harmful in GM technology itself" (Far East Economic Review, 2001). However, people like Dr. M. Herbert, who oppose the use of GM food, described that the continuous use of GM food is like "exposing us to one of the largest uncontrolled experiments in modern industry...no one in the medical profession would attempt to perform experiments on human subjects without their consent. Such conduct is illegal and unethical." Although "no research has been able to pinpoint any dangers (of GM food)... the absence of evidence does not mean that there is evidence of an absence of danger" (Arab News, 1999). Despite of the two opposite viewpoints held by different groups in the society, the effect of media on people's perception of GM food can not be overlooked. One study showed that the increasing amount of technological controversies in press coverage is associated with negative public perception (Gaskell *et al.*, 1999).

The International Scene of GM Food Labeling System

- There is currently no international consensus on the labeling of GM food or on a GM food testing protocol. A number of countries have introduced their own labeling requirements on GM food before the emergence of any international standard. At present, there are two major international approaches to the labeling of GM foods. One approach is to alert consumers to special dietary advice on allergenicity, composition or nutrients only. Thus, labeling is only required for GM foods which are not substantially equivalent to their conventional counterparts. The other approach addresses the need of consumers; informed choices that imply all GM foods have to be labeled accordingly.
- The United States of America and Canada only require labeling of GM food that is not substantially equivalent to its conventional counterpart in terms of composition, nutritional value and allergenicity. In January 2001, the US Food and Drug Administration (FDA) issued a "Guidance for Industry" statement for labeling GM products stating that the only GM foods required labeling are foods that have characteristics different to the non-GM version. (Isaac, Banerji and Woolcock, 2000)
- The European Union (EU), Australia and New Zealand require labeling of all GM food if any ingredient contains more than 1% GM material.
- In Asia, Japan and the Republic of Korea require labeling of certain food products that contain the most common GM agricultural products, such as corn and soybean, as major ingredients. The threshold adopted by Japan is 5% while that of Korea is 3% (Rousu and Whuffman, 2001).

- Table A1 in the Appendix summarizes the national rules of GM labeling system in different countries.

Pros and Cons of GM Food Labeling

Method 1: Labeling of substantially different foods –

(a) Pros

- This labeling approach addresses the basic concerns of most consumers and hence safeguards public health against any potential risks.
- This approach imposes fewer barriers and constitutes less trade implications. It is adopted by some GM crops producers and also Hong Kong's important trading partners such as the United States and Canada.

(b) Cons

- Consumers would not know whether the food contains any GM materials. This labeling approach hence limits their rights to "informed choice". Some consumers would like to make their choices not only based on food safety grounds but also taking environmental, social and ethical issues into consideration (Bonura, 2002)

Method 2: Labeling of all GM foods –

(a) Pros

- Labeling of all GM foods enables consumers to know whether the foods contain any GM materials at all and hence make informed choices.
- Helps to enhance the surveillance and tracing of GM foods.

(b) Cons

- The requirement to label all GM foods is not easy to enforce.
    - There is no international consensus on analytical methods for GM food and not all GM food products are readily identifiable by end-product analysis.
    - Adventitious mixing of GM and non-GM crops may occur during processing and storage, hence establishment of threshold level may be necessary to determine whether the batch of food product is GM or not.
- Additional costs to the trade would be incurred. These costs would be reflected in the food costs, which might be passed to the consumers eventually. The increase in costs may be caused by the following:
    - At present, GM foods and non-GM foods are often mixed together during harvesting, storage and processing. It would be necessary to establish a system to segregate these crops along the food supply chain, especially when the trade would like to source for non-GM food products (Wansink and Kim, 2001) Hence, additional cost would be incurred to establish and maintain segregation systems.
    - There is no single test that can detect all types of GM materials in food items; hence the detection and identification of GM foods would be costly.

Appendix 4 shows a summary of the pros and cons of the above two labeling systems for GM foods

Consumers' Perception and Acceptance of GM Food in other Countries

Despite of the various controversies about GM food, people in different countries have different perception and acceptance for these biotechnological products. For instance, American generally has a positive attitude for GM food. As indicated in a study conducted by the International Food Information Council, 62% of the American in the study claimed that if the potatoes or tomatoes had been genetically modified for better taste or staying fresher, they would be more likely to buy them (Tait, 1999). Furthermore, Professor T. Hoban at North Carolina State University said that "regardless of how we measure consumer perceptions, surveys document that between two-thirds and three-quarters of American respondents are positive about plant biotechnology."

In contrast, consumer resistance in Europe had forced major supermarkets to withdraw all GM food from the shelves. A recent survey of a supermarket chain in Britain confirmed that 25% of the customers want all the GM food to be removed from the shelves in supermarkets (O'Sullivan, 1999). Another study conducted in Europe confirmed that differences are shown in people's perception of GM food in different countries. In that study, it indicated that Danish and German consumers held the least favorable attitude for GM food, then followed by the British consumers, while Italian consumers held the most favorable attitude towards GM food (Bredahl, 2001). Many another countries outside Europe also refused to purchase GM food from United States. To cite a few examples, the largest Japanese flour miller and a few major beer breweries in Asia would stop using any ingredients produced from GMOs (PR Newswire, 2000). Similarly, the largest tortilla maker in Mexico had announced that they will not purchase anymore of the GMO corns. Brazil had also

ripped out their genetically modified soybean seed crops in order to supply the world with the GM-free soybean.

Although many research studies on consumers' perception, awareness and purchases of GM food had been done in many Western countries, only a few similar studies were conducted in Asia. One of the study conducted by Hoban in 1996 indicated that Japanese consumer are generally receptive to GM food despite of their low awareness for the presence of GM products in the market (Hoban, 1996). Another study in Singapore showed that slightly over half of the respondents in the study reported that they worried about GM food (Cheng & Subrahmanyan, 2000). Also, a very large proportion (86%) of them are supportive of the labeling of GM food.

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Situation in Hong Kong

According to the information provided by the Food and Environmental Hygiene Department (FEHD), Hong Kong does not have any commercial production of GM

crops or livestock. Some imported food products at retail level are known to contain genetically modified ingredients. The most common GM food ingredients currently available on the market are soybean, corn, potato and tomato. The USA has been singled out as the major producer of GM crops/food, followed by Argentina and Canada. At present, there is no requirement to label the GM content of pre-packaged or other types of food in Hong Kong.

Also, since Hong Kong does not have any commercial production of GM crops or livestock, food supply is heavily reliant on imports. Consistent with the existing policy on food safety and health, it is unlikely for Hong Kong to introduce a measure ahead of any other major supplying countries. The international community has yet to define a consensual policy on GM food labeling. The Codex Alimentarius Commission of the United Nations is unlikely to set an internationally agreed standard before 2003. It is obvious that food labeling will remain in the spotlight, as consumers demand more and more information about the foods they buy. What must go on labels? And what can be left optional or be provided in other ways? Apparently, it is not easy for food manufacturers to claim "GM free", a label that is thought to gain popularity in today's consumer sentiment.

We have conducted a telephone interview with the Executive Officer of FEHD of Hong Kong, Mr. David Leung. He stated that FEHD is studying the economic impact of the setting up a GM food labeling system to society and food manufacturers. According to the information published by the Department, issues to be considered include: (1) International practice; (2) Costs of compliance and the implications for

the food industry and consumers and (3) Enforcement and testing. In the meantime, no timeline has been determined for the implementation of this system.

The General Public's Perception of GM food and their Attitude towards the GM Food Labeling System

In term of consumers' perception and awareness, a study conducted by the FEHD indicated that 82.5% of respondents in Hong Kong had heard about the term GM food; the awareness level increases as the respondents' education level and income level increase. Among those who had heard about GM food, 50.5% indicated that they would not purchase GM foods while 34.6% will buy them. Furthermore, there is evidence showing that the younger the respondents, the stronger intention for them to buy GM foods. The major concerns for the purchases of GM food included the safety and healthiness of the GM foods.

As for the general public's attitude towards the GM Food Labeling System, 97.7% of respondents think that there is a need for the labeling of GM food. Reasons for the need of the labeling included "consumers' right to know", "to be able to make informed choices" and "to be able to trace back the suppliers if problem arose". Furthermore, 46.3% of respondents think that they are willing to pay more for the labeling while 26.5% do not think so.

Hong Kong's Public Concerns

Green and consumers groups have called for the labeling of GM food to provide more information for consumers.

Public concerns about GM food mainly include:

(a) Possible environmental impact of GM crops; and

(b) Consumers' 'right to know' - Religious and vegetarian groups are worried that they may consume food containing genes from animals which they do not eat for religious or other reasons; GM food may cause allergic reactions and antibiotic resistance.

The HKSAR Government outlined the following three options for GM food labeling system in the Public Consultation Paper in March 2001:

A. To encourage the food trade to label GM food voluntarily following a set of guidelines issued by the Government;

B. To provide for mandatory labeling by introducing legislative amendments; and

C. As a first step, to encourage the food trade to label GM food voluntarily following guidelines issued by the Government and to provide for mandatory labeling by legislative amendments at a later date taking into account developments on the international fronts.

In view of the government's recent effort in consulting the general public's opinion on the implementation of the GM food labeling system, this research study will focus on examining the general public's knowledge, awareness, perception, and purchasing behavior for GM food. Also, their reaction and opinion about the proposed GM Food Labeling System will be studied. After analyzing the results, recommendations will be made for the government, raw material suppliers, and various food manufacturers in Hong Kong accordingly.

CHAPTER II

RESEARCH OBJECTIVE AND METHODOLOGY

Research Objectives

The four objectives for this research are as follows:

(i) To look at the general public's knowledge about / awareness of genetically modified (GM) food

(ii) To investigate consumers' perception and attitude toward GM food

(iii) To study consumers' purchasing behavior

(iv) To evaluate consumers' opinions and reactions to the GM Food labeling system in Hong Kong

Methodology

Research Design

Questionnaires were formulated to collect primary data according to the four research objectives aforementioned. Two pilot tests were conducted to ensure the questions in the questionnaire are unambiguous and appropriate for data analysis. In these pilot tests, 30 individuals from the general public were chosen each time and they were

asked to complete the questionnaire. Revision of the questionnaire was made after the first pilot test in order to rephrase some of the wording and questions in the questionnaire.

Two interviews were conducted with officials from Greenpeace and the Food and Environmental Hygiene Department to obtain the information regarding the latest developments of GM food and the food manufacturing industry in Hong Kong.

Questionnaire

A structured, undisguised questionnaire was used and it was divided into 5 sections. Section A surveyed the respondents' knowledge and awareness of GM food. Section B compared the respondents' perception of GM food and traditionally produced food. Section C investigated the respondents' attitudes towards GM food and their purchasing behavior if they were asked to choose between GM food and traditionally produced food. Section D examined respondents' opinions and reactions to the GM food labeling system and the major determinants for the food they purchased. Section E covered the demographics of the respondents. Both Chinese and English questionnaires are available.

A Likert scale ranging from 1 to 6 was used to determine respondents' level of agreement / disagreement with different statements relating to the 4 research objectives. For the comparison of the four major attributes for GM food and traditionally produced food, respondents will have to assign a score ranged from 1 to 6 for each of the attribute, and they could choose the choice "don't know" as their

answer if they are uncertain. In addition, both multiple choice and dichotomous questions were used in the questionnaire. Both the Chinese and English questionnaires are included in the Appendix 5 and Appendix 6 respectively.

Data collection method

Convenience sampling was used for collecting samples for this research study. The target population for this research study are the general public who are aged 15 or above. 300 questionnaires were distributed in person to the general public. For example, these questionnaires were given to people in a restaurant, a factory, offices, and to students in both high school and university. 100 questionnaires were also sent to personal friends and relatives via emails. The response rate for getting back a completed questionnaire in person is 74% while it is 68% for that distributed through email. A total of 290 questionnaires were collected, 3 of the questionnaires were not used in the analysis due to incompleteness. Questionnaires were considered as incomplete if there were more than 5 missing values in the whole questionnaire. Also, only one answer can be selected for each question, if multiple answers were chosen for a question, that question will be treated as unanswered and a missing value will be assigned to it.

Data Analysis Method

All the data collected were coded and tabulated. SPSS was used for performing various statistical tests to analyze the data. Functions like frequency, cross-tabulation,

chi square, paired-samples t-test, one-way ANOVA, Scheffe test were used for obtaining the statistical results. In some cases, since the number of samples that fell into specific groups for a certain variable is very small; formal statistical test can not be performed. Also, due to the scale of measurements, formal statistical test can not be perform for certain data without recoding of data. Thus, the categories for some of the variables are recoded and grouped together in order to increase the number of samples that fell into specific groups. The recoded categories for each variable are listed as follows:

Questions	**Original Categories**	**New Categories**
B1 and B2	Score 1 - 3	Poor
	Score 4 - 6	Good
	Don't know	Don't know
C1 – C8 and D1 - D4	Scale 1 - 3	Agree
	Scale 4 - 6	Disagree
E1	Below 15 and 15 - 24	24 or below
	25 - 34	25 - 34
	35 – 44, 45 – 54, 55- 64, and 65 or above	35 or above
E3	Once a month or less, Once every 3 weeks, and Once every 2 weeks	Once every 2 weeks or less
	Once a week	Once a week
	2 to 6 times a week and Everyday	Twice a week or more
E4	Primary or below and Secondary	Secondary or below
	Diploma	Diploma
	Bachelor or above and Others*	Bachelor or above
E6	HK$15000 or below	HK$15000 or below
	HK$15001 - 30000	HK$15001 - 30000
	HK$30001 – 45000, HK$45001 – 60000, HK$60001 or above	HK$30001 or above

* Since there is only 1 respondent who chose Others, its effect is negligible

CHAPTER III

RESEARCH FINDINGS AND IMPLICATIONS

With the use of questionnaire, data were collected to evaluate the four objectives for this research study. Critical questions were constructed according to the following objectives:

(i) To look at the general public's knowledge/ awareness for genetically modified (GM) food

(ii) To investigate consumers' perception and attitude toward GM food and traditionally produced food

(iii) To study consumers' purchasing behavior

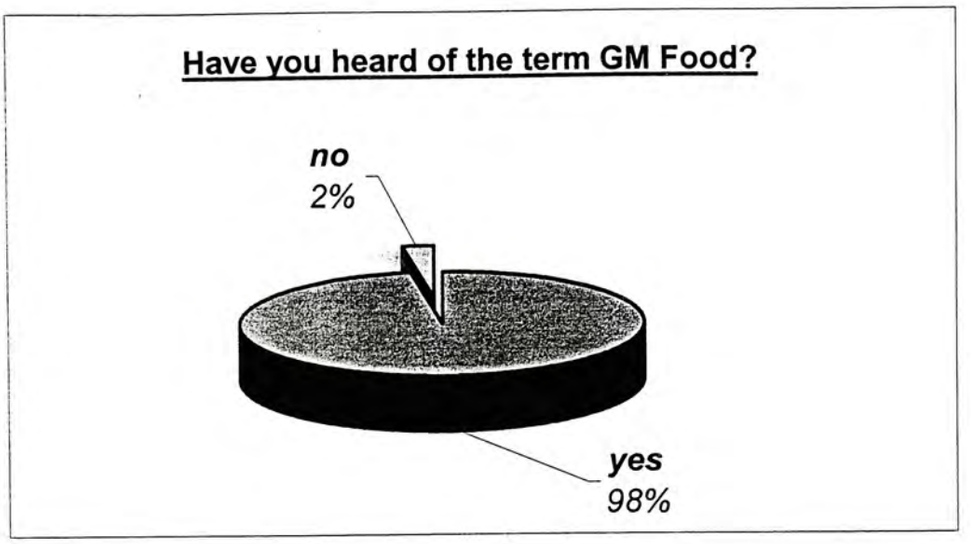
(iv) To evaluate consumers' opinions and reactions to the GM Food labeling system in Hong Kong

The major results for this research study are presented as follows.

General Public's knowledge about / awareness of GM food

Firstly, the general public's knowledge about / awareness of GM food were studied.

Fig 1: Percentage of respondents who have heard about the term 'GM Food'



As shown in Fig 1, 98% of respondents reported that they had heard of the term GM food while only 2% of respondents reported that they had not heard of the term. Overall, the awareness of GM food of the general public in Hong Kong is very good.

Fig 2: Percentage of respondents with different level of understanding of the term GM Food

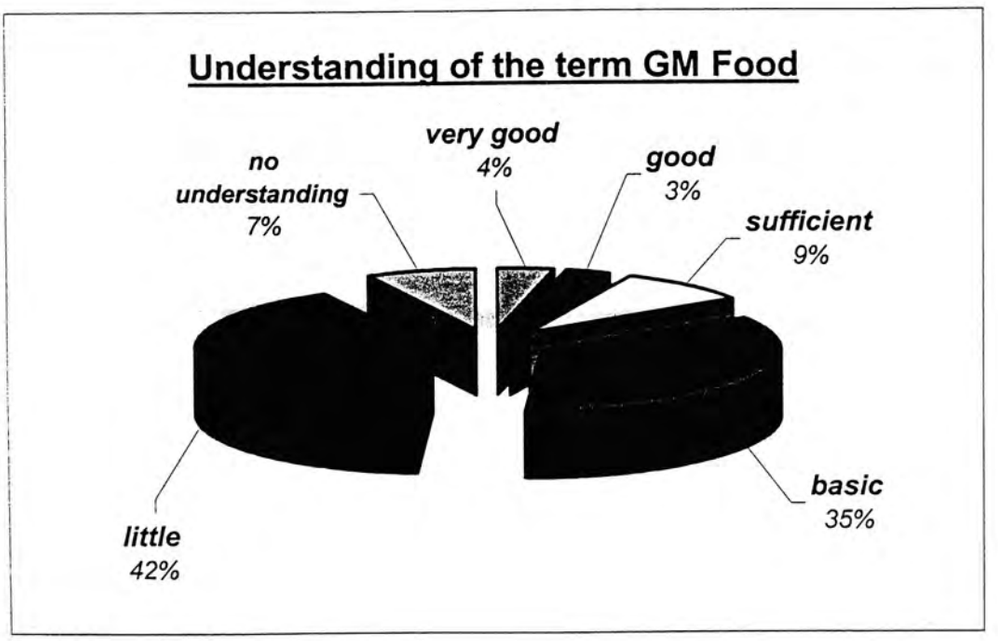
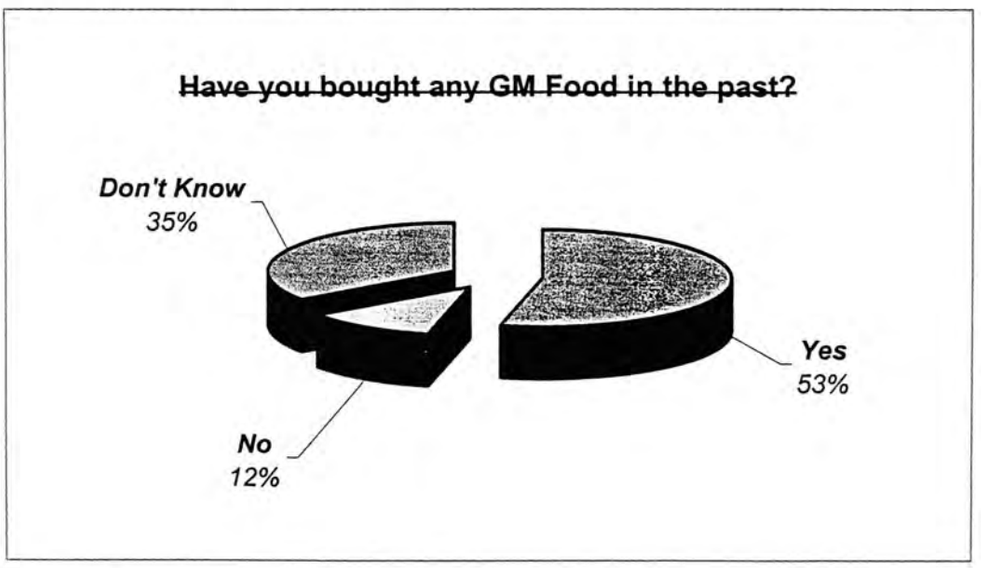


Fig 2 shows that 7% of the respondents claimed that they have no understanding of the term GM food, 42% claimed that they have very little understanding of the term, 35% claimed that they have some basic understanding of the term, 9% claimed that they have sufficient understanding of the term, 3% claimed that have good understanding of the term and 4% claimed that they have very good understanding of the term. By combining the results, the majority of respondents (77%) claimed that they have very little or some basic understanding of the term GM food, only 16% of respondents claimed that they have sufficient or higher level of understanding of the term GM food. This reflects that the general public's understanding of GM food is very limited.

Fig 3: Percentage of respondents who have bought GM food in the past



The majority of respondents (53%) was aware that they had bought GM food in the past. 12% of them had not bought any GM food in the past, while 35% of respondents did not know if they had bought any GM food in the past. This suggests that not enough information is given to the general public about whether the food products contain any GM ingredients.

Consumers' Perception and Attitude toward GM food and Traditionally Produced Food

Using a 6-point scale, respondents were asked to rate the different attributes for both GM food and traditionally produced food, with 1 representing very poor and 6 representing very good for different attributes. Respondents could answer "Don't know" if they were not sure.

Table 1: Rating Given to the Quality, Nutritional Value, Price and Safety of Consumption to GM Food

	Mean Score	Percent of respondents who think GM food is "poor"	Percent of respondents who think GM food is "good"	Percent of respondents who answered "Don't know"
Quality	3.95	21.0%	48.6%	30.4%
Nutritional Value	3.47	31.2%	34.1%	34.7%
Price	3.86	23.5%	45.6%	30.9%
Safety of Consumption	3.15	32.2%	25.5%	42.3%

As shown in Table 1, in terms of quality, GM food has a mean score of 3.95; 48.6% of the respondents think that the quality of GM food is good while 21.0% of respondents think that it is poor. In terms of the nutritional value of GM food, it has a mean score of 3.47; 34.1% of respondents think that it is good and 31.2% think that it is poor. As for the price of GM food, it has a mean score of 3.86; 45.6% think that it is good and 23.5% think that it is poor. As for the safety of consumption for GM food, the mean score is 3.15; also, 25.5% of respondents think that it is good while 32.2% of respondents think that it is poor.

Table 2: Rating Given to the Quality, Nutritional Value, Price and Safety of Consumption to Traditionally Produced Food

	Mean Score	Percent of respondents who think traditionally produced food is "poor"	Percent of respondents who think traditionally produced food is "good"	Percent of respondents who answered "Don't know"
Quality	4.44	15.1%	78.9%	6.0%
Nutritional Value	4.57	13.4%	80.6%	6.0%
Price	4.08	23.9%	59.8%	6.3%
Safety of Consumption	4.58	15.7%	76.6%	7.7%

As shown in Table 2, 78.9% of respondents think that the quality of traditionally produced food is good while 15.1% think that it is poor; it has a mean score of 4.44. In terms of nutritional value, 80.6% of respondents think that it is good and 13.4% think that it is poor; it has a mean score of 4.57. Also, 59.8% think that the price of traditionally produced food is good and 23.9% think it is poor; also, it has a mean score of 4.08. Lastly, in terms of safety of consumption, 76.6% of respondents think that it is good while only 15.7% think that it is poor for traditionally produced food; the mean score for this attribute is 4.58.

Table 3: Hypothesis Testing for the Mean Score of Four Different Attributes between GM Food and Traditionally Produced Food

Hypotheses	Significance (2-tailed, p-value)	Results
H_0: There is no difference in the mean score for *quality* between GM food and traditionally produced food **H_1:** There is difference in the mean score for *quality* between GM food and traditionally produced food	0.000	**H_0** is rejected, there is statistically significant difference in the mean score for quality between GM food and traditionally produced food
H_0: There is no difference in the mean score for *nutritional value* between GM	0.000	**H_0** is rejected, there is statistically significant

food and traditionally produced food **H_1:** There is difference in the mean score for *nutritional value* between GM food and traditionally produced food		difference in the mean score for nutritional value between GM food and traditionally produced food
H_0: There is no difference in the mean score for *price* between GM food and traditionally produced food **H_1:** There is difference in the mean score for *price* between GM food and traditionally produced food	0.130	Can not reject **H_0**; therefore, there is no statistically significant difference in the mean score for price between GM food and traditionally produced food
H_0: There is no difference in the mean score for *safety of consumption* between GM food and traditionally produced food **H_1:** There is difference in the mean score for *safety of consumption* between GM food and traditionally produced food	0.000	**H_0** is rejected, there is statistically significant difference in the mean score for safety of consumption between GM food and traditionally produced food

Table 4: Results of the Paired Samples T Test for the Mean Score of the Four Different Attributes for GM Food and Traditionally Produced Food

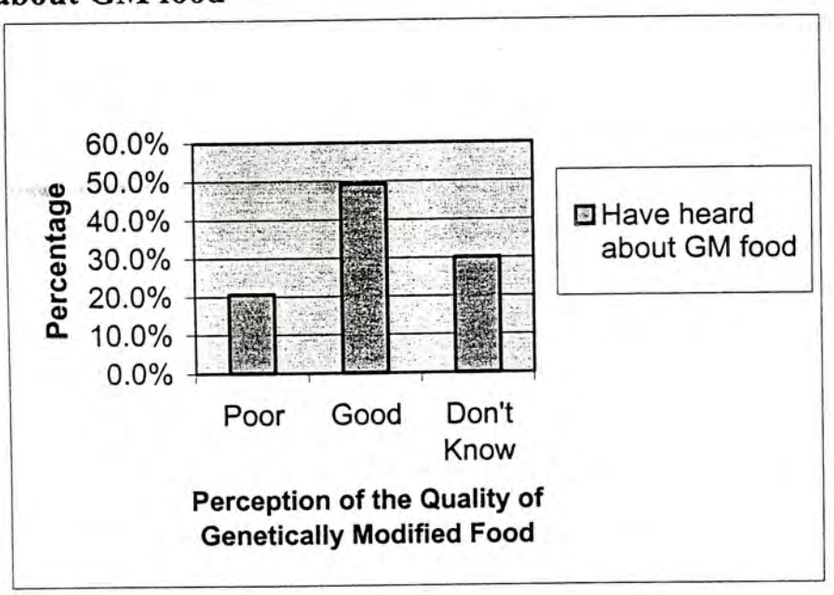
Attributes	Mean Score for Traditionally Produced Food	Mean Score for GM Food	Mean Paired Differences	T - Value	Significance (2-tailed, p-value)
Quality	4.41	3.94	-0.47	-3.781	0.000
Nutritional Value	4.59	3.46	-1.13	-9.002	0.000
Price	4.02	3.83	-0.19	-1.521	0.130
Safety of Consumption	4.59	3.17	-1.42	-8.258	0.000

Paired t – test was used to analyze the mean scores of the four different attributes for GM food and traditionally produced food. Hypotheses were formulated to test whether there is any statistically significant difference between the mean score of GM food and traditionally produced food for each of the four different attributes. Table 3 shows the four sets of hypotheses and the result of the t-test. Out of the four attributes, it was found that the mean scores for quality, nutritional value and safety of consumption between GM food and traditionally produced food differed significantly

($p < 0.05$). Therefore, the null hypotheses (H_0) for these three attributes are rejected. The mean scores for the three aforementioned attributes for traditionally produced food are significantly higher than those for GM food. A summary for the results of the paired t-test is shown in Table 4. Therefore, the general public's perception of traditionally produced food is better than that of GM food in terms of quality, nutritional value and safety of consumption.

Quality

Fig 4: Perception of the quality of GM Food of respondents who have heard about GM food



As shown in Fig 4, among those who had heard of the term GM food, a higher percentage will give a better rating for the quality of GM food in general. However, there are still a relatively large percentage of respondents who do not have any idea about the quality of GM food. It implies that many people, even if they had heard of the term GM food before, are still uncertain about the quality of GM food.

Fig 5: Perception of the quality of GM food for respondents with different shopping frequencies

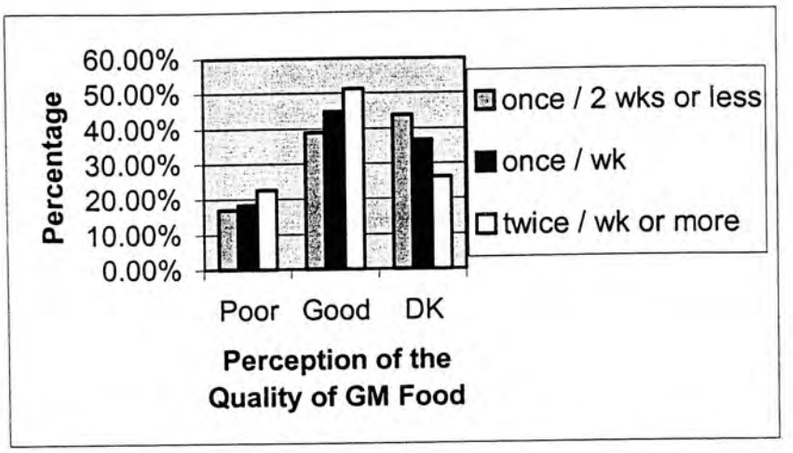


Fig 6: Perception of the quality of GM food for respondents with different education levels

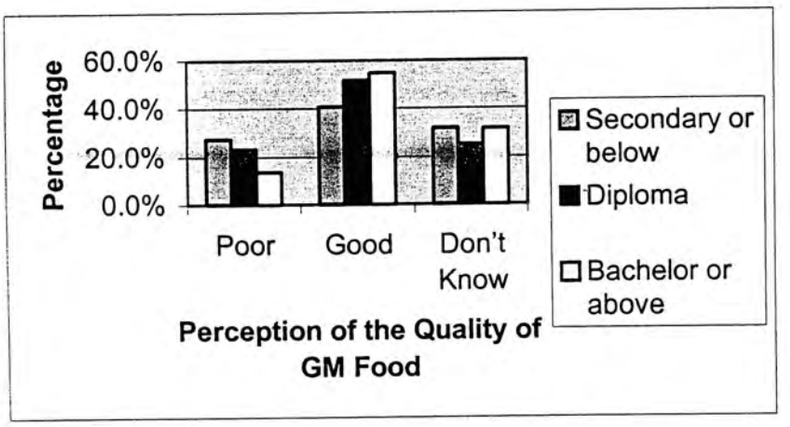


Fig 5 shows that the more frequently people shopped for groceries, the greater the percentage will give a higher rating for the quality of GM food. This might be due to the fact that frequent shoppers have more opportunities to be exposed to GM food or that they might have learnt some related information about GM food. Therefore, they will give a higher rating for its quality. Also, Fig 6 shows that the higher the education level of the respondents, the greater the percentage will give a higher rating for the quality of GM food. It is clear that respondents with a higher level of education completed will have better access to information on GM food or its

properties. Thus, more educated respondents will give GM food a higher rating for its quality.

Nutritional Value

Fig 7: Perception of the Nutritional Value of Traditionally Produced food for respondents with different education levels

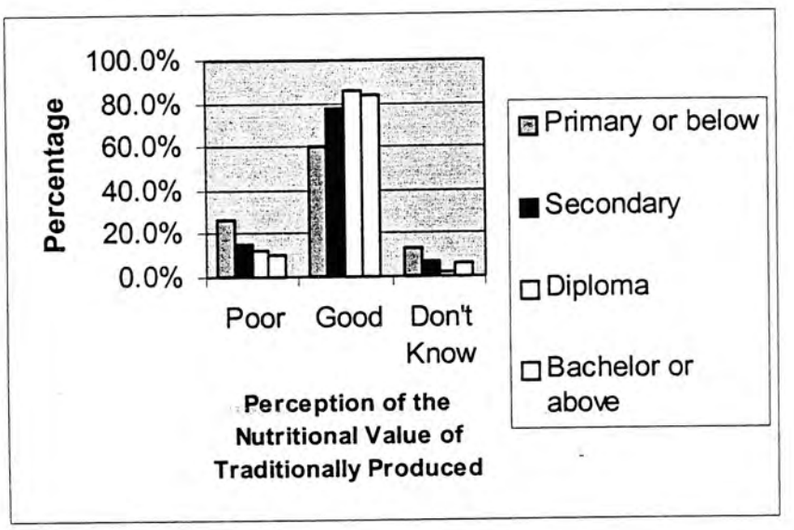


Fig 8: Perception of the nutritional value of GM food for respondents with different education levels

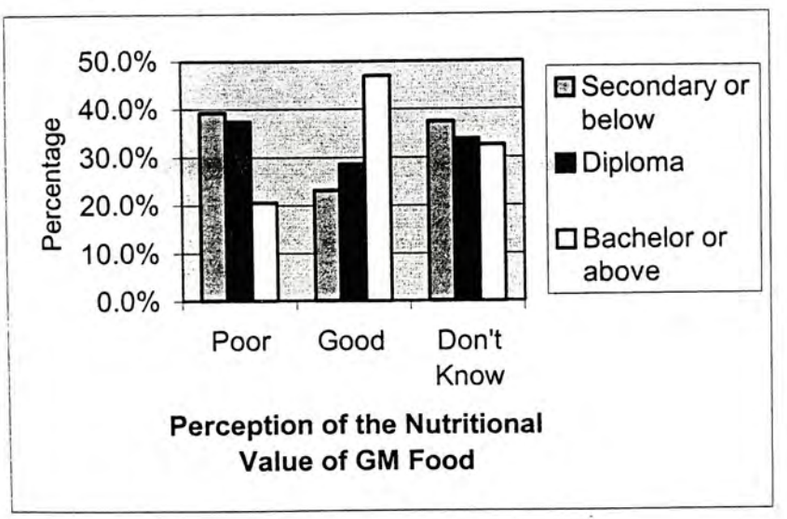


Fig 9: Perception of the nutritional value of GM food for respondents with different shopping frequencies

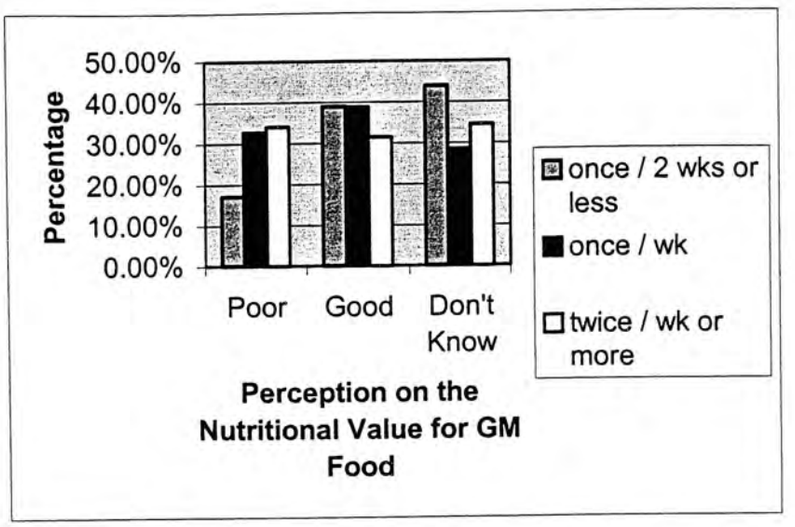


Fig 10: Percentage of respondents from different age groups agreeing/disagreeing the statement "Generally speaking, I think GM food is nutritious

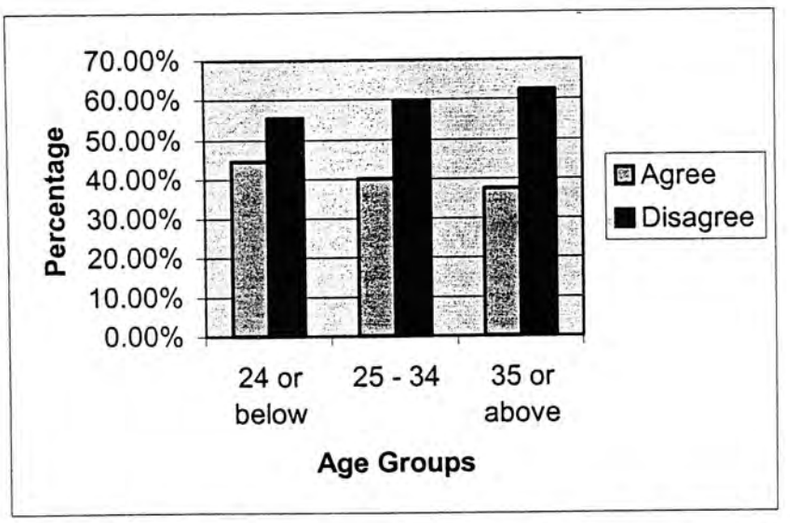


Fig 7 indicates that the higher the education level of the respondent, the greater the tendency is to give a higher rating for the nutritional value of traditionally produced food. There is a statistically significant difference among the people at different age groups for their perception of the nutritional value of traditionally produced food ($p < 0.05$).

Fig 8 shows that as the higher the education level of the respondent, the greater the tendency is to give a higher rating for the nutritional value of GM food. There is a

statistically significant difference among the groups with different education levels for their perception of the nutritional value of GM food ($p < 0.05$). This might suggest that with a higher education level, respondents might be more open and receptive to new things such as GM food. Therefore, they gave a better rating for the nutritional value of GM food than their less-educated counterparts. Fig 9 shows that the more frequently the respondents shopped for groceries, the greater number will give a low rating for the nutritional value for GM food. This result actually contrasts with the result for the quality of GM food; thus, it might suggest that quality and nutritional value are not directly related. Fig 10 shows that the greater the age of the respondents, the larger percentage will disagree with the statement "Generally speaking, I think GM food is nutritious." Hence, it is clear that older generations generally have a less positive perception of the nutritional value of GM food.

Price

Fig 11: Perception of the price of GM food by respondents who have heard about GM Food

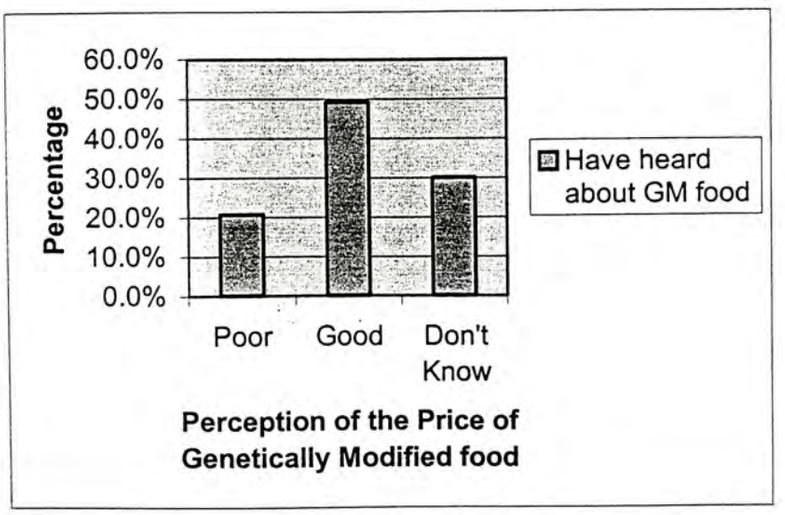


Fig 12: Perception of the price of GM food from respondents of different age groups

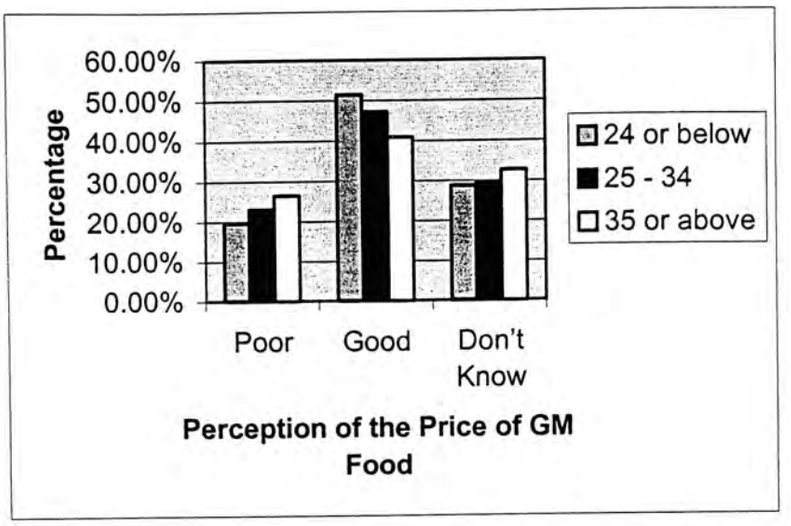


Fig 11 shows that the price of GM food is given a higher rating (lower price) by those who have heard of the term GM food. However, there is still a relatively large percentage of respondents who answered "don't know" about the price of GM food even though they had heard of GM food in the past. They are still uncertain about the price of GM food. Fig 12 indicates that the greater the age of the respondents, the larger percentage will give a lower rating for the price of GM food. This might be due to the fact that they generally do not have a very good perception of GM food as a whole. Therefore, they will give it a low rating for this attribute. There is a statistically significant difference among the people at different age groups for their perception of the price of GM food ($p < 0.05$).

Table 5: Statistical Difference between Male and Female Respondents in the Price of Traditional Food

	Poor	Good	Don't Know
Female	20.1%	75.8%	4.0%
Male	28.6%	62.4%	9.0%

There is a statistically significant difference between male and female respondents in their perception of the price of traditional food ($p < 0.05$). More male respondents perceived the price for traditionally produced food to be poor while more female respondents perceived the price for traditionally produced food to be good. The results are summarized in Table 5.

Safety of Consumption

Fig 13: Percentage of respondents from different age groups agreeing/disagreeing the statement "Generally speaking, I think GM food is safe for human consumption."

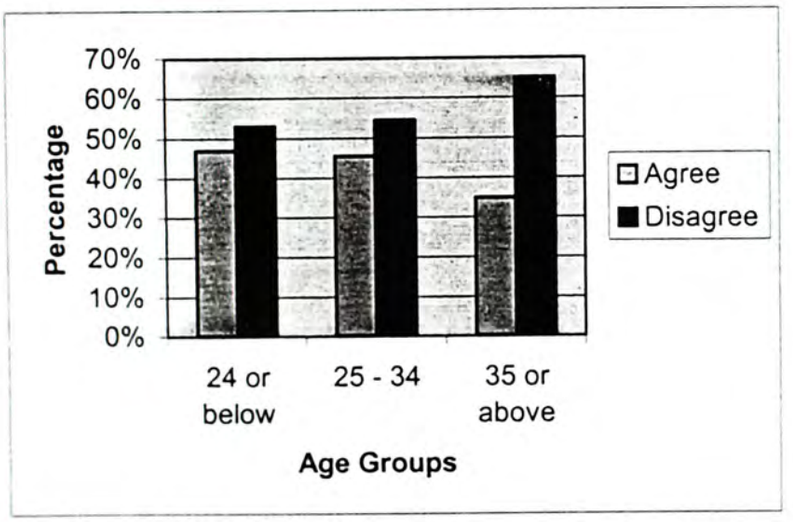


Fig 13 indicates that the greater the age of the respondents, the larger the percentage who disagree with the statement "Generally speaking, I think GM food is safe for human consumption." Therefore, older people seem to have a less positive perception of the safety of consumption for GM food.

Table 6: Mean Score and Percentage of respondents agreeing/disagreeing with the listed statements

Statement	Mean Score	Agree with the statement	Disagree with the statement
1. Generally speaking, I think GM food is safe for human consumption	3.891608	41.6%	58.4%
2. Generally speaking, I think GM food is nutritious	3.808511	40.1%	59.9%

Table 6 shows the mean score and the percentage of respondents agreeing / disagreeing with a list of statements for their perception of GM food. Again, a 6-point scale was used, and 1 representing "strongly agreeing" and 6 representing "strongly disagree" with the statement. For statement 1, a mean score of 3.89 was found with 41.5% agreeing that GM food was safe for human consumption while 58.2% disagreeing. There is a statistically significant difference among the groups with different education levels in agreeing / disagreeing with the statement ($p < 0.05$). For statement 2, the mean score was 3.81, and 39.4% agreed that GM food was nutritious whereas 58.9% disagreed. However, they show a relatively negative opinion on the safety of for human consumption and nutritional value of GM food. There is a statistically significant difference among the groups with different education levels in agreeing / disagreeing with the statement ($p < 0.05$).

Table 7: Significant Difference between Male and Female in their Perception of the Statement "Generally speaking, I think GM food is safe for human consumption."

	Agree	Disagree
Female	32.9%	67.1%
Male	51.1%	48.9%

There is a significant difference found between male and female in agreeing and disagreeing with the statement "Generally speaking, I think GM food is safe for

human consumption" ($p < 0.05$). As shown in Table 7, 67.1% of female respondents disagreed with the statement while only 48.9% of male respondents disagreed with it. This suggests that female respondents are more skeptical in the safety of consumption of GM food.

Fig. 14: Percentage of respondents with different education level agreeing/disagreeing the statement "Generally speaking, I do not mind eating GM food."

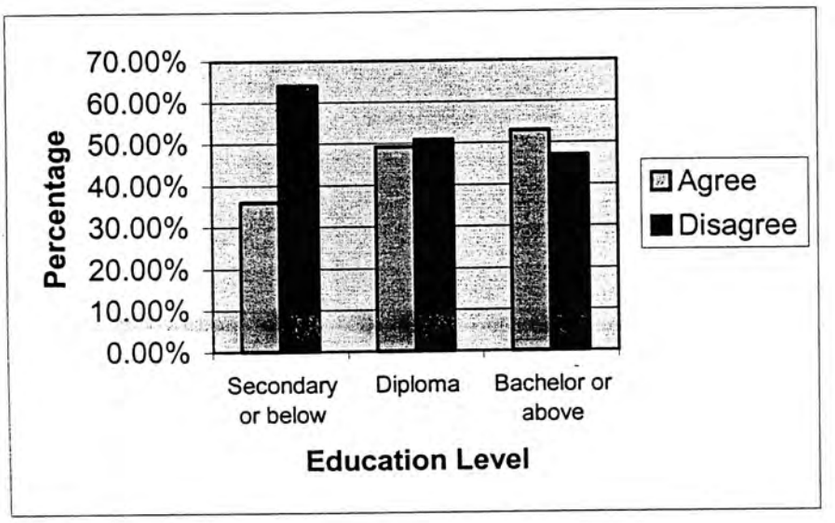


Fig 14 shows that the higher the education level completed by the respondents, the greater the number who will agree with the statement "Generally speaking, I do not mind eating GM food." There is a statistically significant difference among the groups with different education levels in agreeing / disagreeing with this statement ($p < 0.05$). This indicates that the higher the education level completed by the respondents, the more likely they are to accept GM food and eat it.

Consumers' Purchasing Behavior

Table 8: Mean Score and the Percentage of respondents agreeing/disagreeing with the listed statements

Statement	Mean Score	Agree with the statement	Disagree with the statement
1. Generally speaking, I do not mind eating GM food.	3.72028	45.5%	54.5%
2. Generally speaking, I do not mind buying GM food	3.606272	51.2%	48.8%
3. Given the same price and quality, I would buy the one that is traditionally produced over the one that is GM	2.388112	76.5%	23.5%
4. Given the same quality, if the price of the GM product is lower than the traditional produced one, I would buy the GM one	3.756098	45.3%	54.7%
5. Given the same quality, if the price of GM product is higher than the traditional produced one, I would buy the GM one	4.513986	23.1%	76.9%
6. Given the same price, if the quality of GM product is better than the traditional produced one, I would buy the GM one	3.484211	53.7%	46.3%

According to Table 8, statement 1has a mean score of 3.72; with 45.3% of respondents agreed that they did not mind eating GM food whereas 54.4% disagreed. For statement 2, the mean score is 3.61; 51.2% of respondents agreed that they did not mind buying GM food whereas 48.8% disagreed. In summary, the general public does not have strong preference whether to eat or to buy GM food. Statement 3 has a mean score of 2.39; with 76.5% of respondents agreed that given the same price and quality for 2 food products, they would buy the one that is traditionally produced over

the one that is genetically modified whereas 23.6% disagreed with that statement. Even if GM food and traditionally produced food have the same quality and price, the general public seems to be more in favor of traditionally produced food.

For statement 4, it has a mean score of 3.76 was found; 45.3% of respondents agreed that given the same quality for 2 food products, if the price of the GM product is lower than the traditionally produced, they would buy the GM one. 54.7%respondents disagreed with the statement. This suggests that price has an impact on consumers' purchasing behavior. Statement 5 yields a mean score of 4.51. Only 23.1% of respondents agreed that given the same quality for 2 food products, if the price of the GM product is higher than the traditional one, they would buy the one that is genetically modified. 76.7% of respondents disagreed with this statement. Together with the above result, it is worth noting that price is an important factor in consumers' purchasing behavior in food products.

For statement 6, it has a mean score of 3.48 was found. 53.7% of respondents agreed that given the same price of 2 food products, if the quality of the GM product is better than that of the traditionally produced one, they would buy the genetically modified one. 46.3% disagreed with the statement. Thus, implying that quality is another one of the factors that influence consumers' purchasing behavior.

Fig 15: Most important factor for determining your choice of food purchased

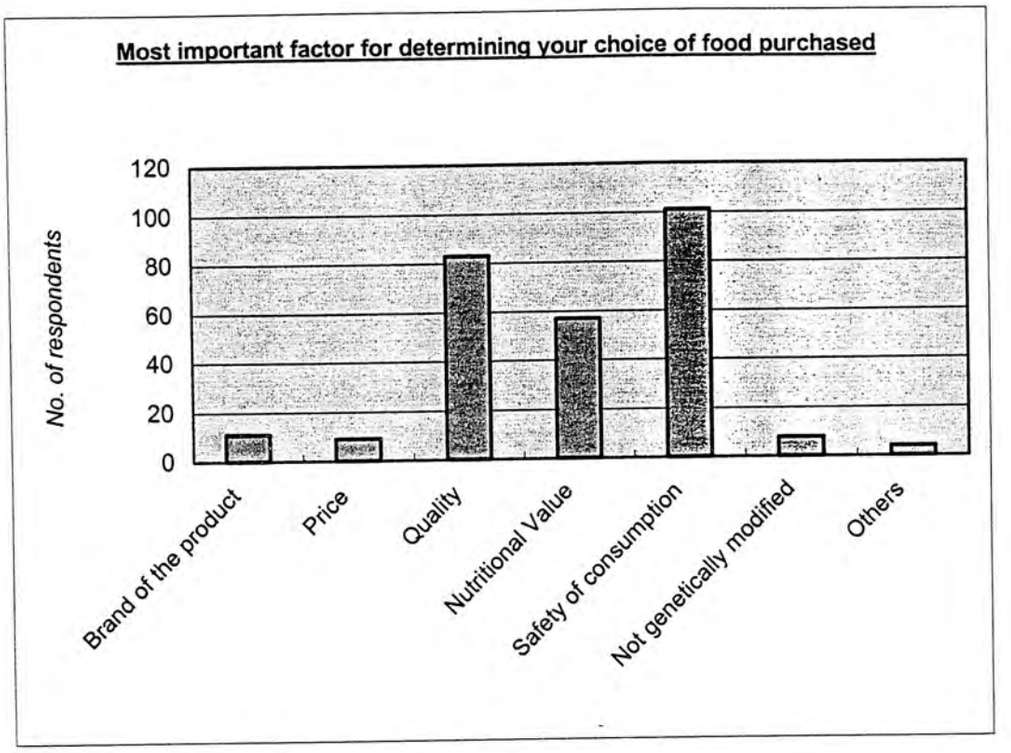
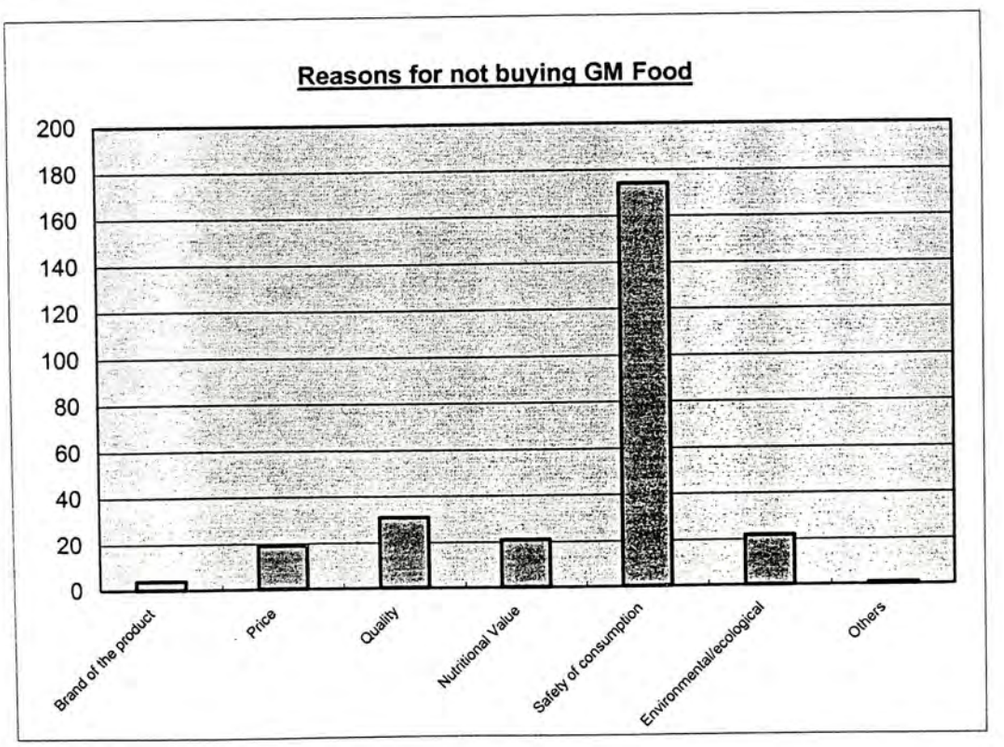


Fig 16: Reasons for not buying GM food



From Fig 15, it is clear that 37% of respondents claimed that the most important factor for determining their choice of food purchase is safety of consumption, whereas

30.4% and 20.9% of respondents mentioned that the quality and nutritional value of food as the most important factor respectively. The importance of brand, price and whether the product was genetically modified are relatively trivial in determining their choice of purchase. Fig 16 shows that the relationship between safety of consumption and the reasons for not buying GM food is important; 64% of respondents mentioned that safety of consumption is the major reason for not buying GM food. Other factors such as quality, environmental/ecological issues, nutritional value and price have a respective percentage of 11.4%, 8.1%, 7.7% and 7%. This suggests that safety of consumption of food products is the biggest concern of the respondents.

Fig 17: Percentage of respondents with different education background agreeing/disagreeing the statement "Given the same price and quality for 2 food products, I would buy the one that is traditionally produced over the one that is genetically modified."

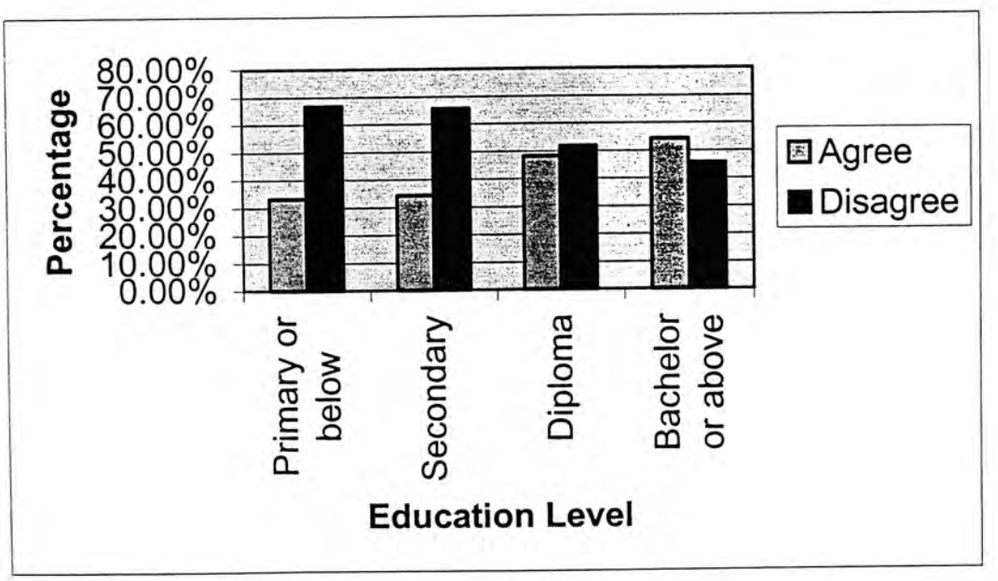


Fig 18: Percentage of respondents with different education background agreeing/disagreeing the statement "Given the same quality for 2 food products, if the price for the GM product is lower than that of the traditionally produced one, I would buy the GM one."

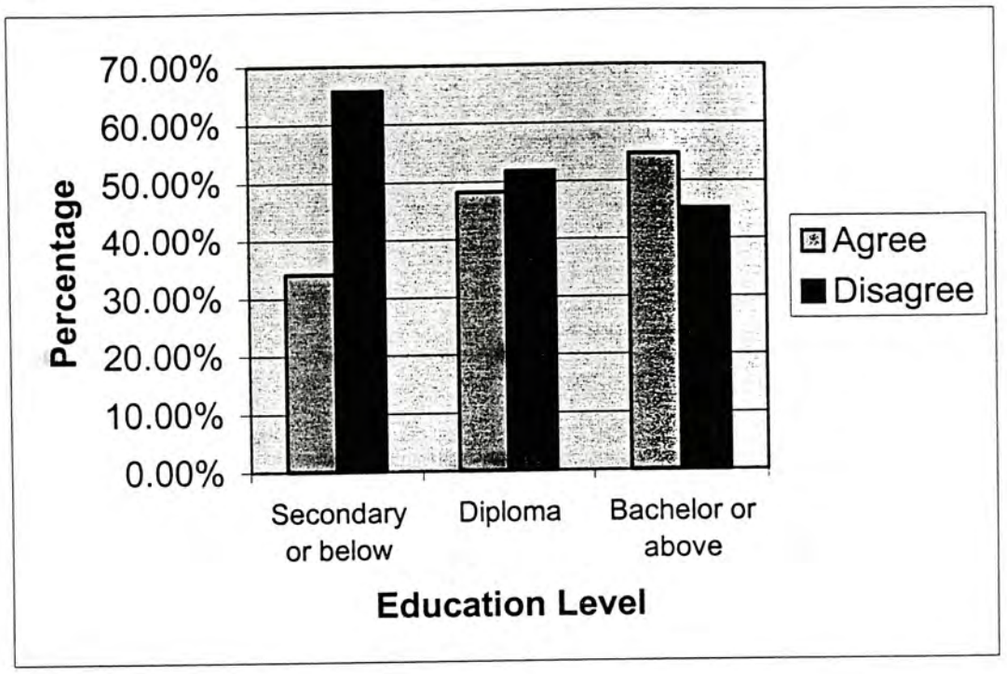


Fig 17 shows that the higher the education level completed by the respondents, the greater number who will agree with the statement "Given the same price and quality for 2 food products, I would buy the one that is traditionally produced over the one that is genetically modified." Fig 18 indicates that as the respondents' education level increases, more of them will agree with the statement "Given the same quality for 2 food products, if the price for the GM product is lower than that of the traditionally produced one, I would buy the GM one." Also, there is a statistically significant difference among the groups with different education levels in agreeing / disagreeing with this statement ($p < 0.05$). These results imply that price is also an important determinant for their purchase of food.

Fig 19: Percentage of respondents from different age groups agreeing/disagreeing the statement "Generally speaking, I do not mind buying GM food."

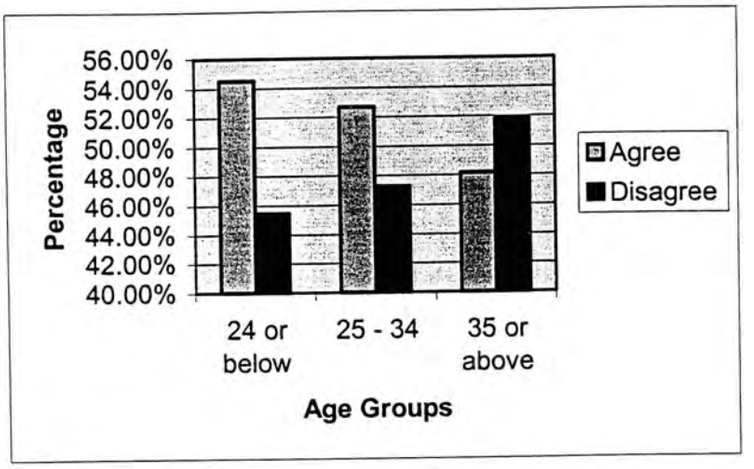


Fig 20: Percentage of respondents from different age groups agreeing/disagreeing the statement "Given the same quality for 2 food products, if the price of the GM product is lower than that of the traditionally produced one, I would buy the GM one."

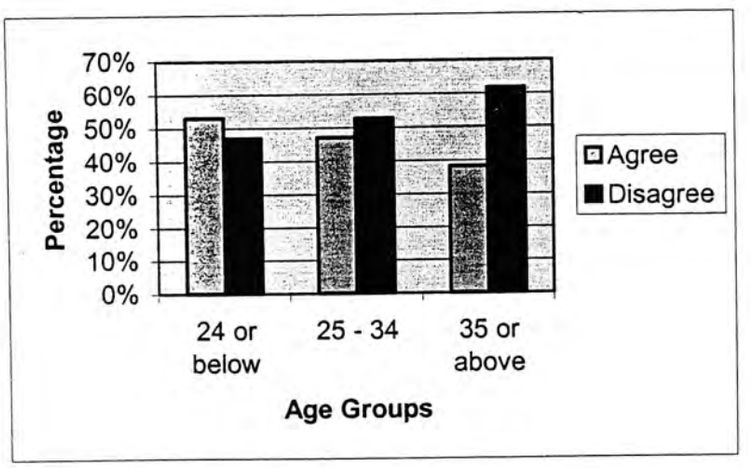


Fig 19 shows that the greater the age of the respondents, the larger the percentage of them who will disagree with the statement "Generally speaking, I do not mind buying GM food." Fig 20 shows that the greater the age of the respondents, the larger the percentage who will disagree with the statement "Given the same quality for 2 food products, if the price of the GM product is lower than that of the traditionally produced one, I would buy the GM one." These results suggest that the older people do not like to buy GM food, even if its price is lower than that of the traditionally produced food.

To evaluate consumers' opinions and reactions

to the GM Food labeling system in Hong Kong

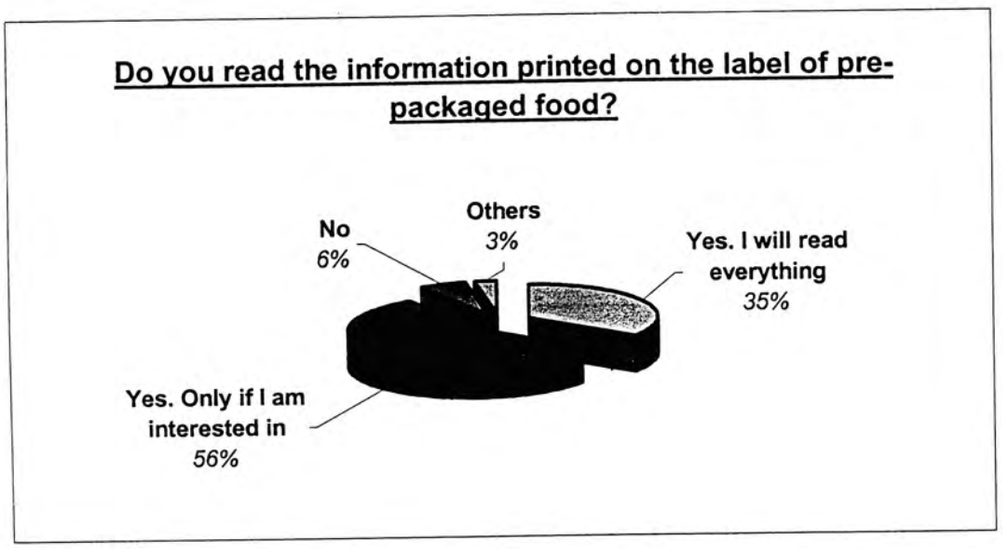
Table 9: Mean Score and the Percentage of respondents agreeing/disagreeing with the listed statements

Statement	Mean Score	Agree with the statement	Disagree with the statement
1. I think GM Food Labeling System is useful in helping me to choose which food brand to buy	2.087719	84.6%	16.4%
2. I think consumers should have the right to know whether the food they purchased contains any GM ingredients	1.672474	89.2%	10.8%
3. I think it is necessary for the government to implement the GM Food Labeling System	1.843206	89.2%	10.8%
4. I think it is worthwhile for government to implement GM Food Labeling System even if the labeling system would lead to a slight increase in the price of food	2.671329	71.3%	28.7%

Table 9 shows that 84.6% of respondents agreed that GM Food Labeling System was useful in helping them to choose which food brand to buy while only 16.4% disagreed. The majority (89.2%) of respondents agreed that consumers should have the right to know whether the food they purchased contained GM ingredients and that it is necessary for the Government to implement the GM Food Labeling System, whereas 10.8% of respondents disagreed with the statement. 71.3% of respondents agreed that it is worthwhile for Government to implement GM Food Labeling System even if the system would lead to a slight increase in the price of food, while 28.7% of

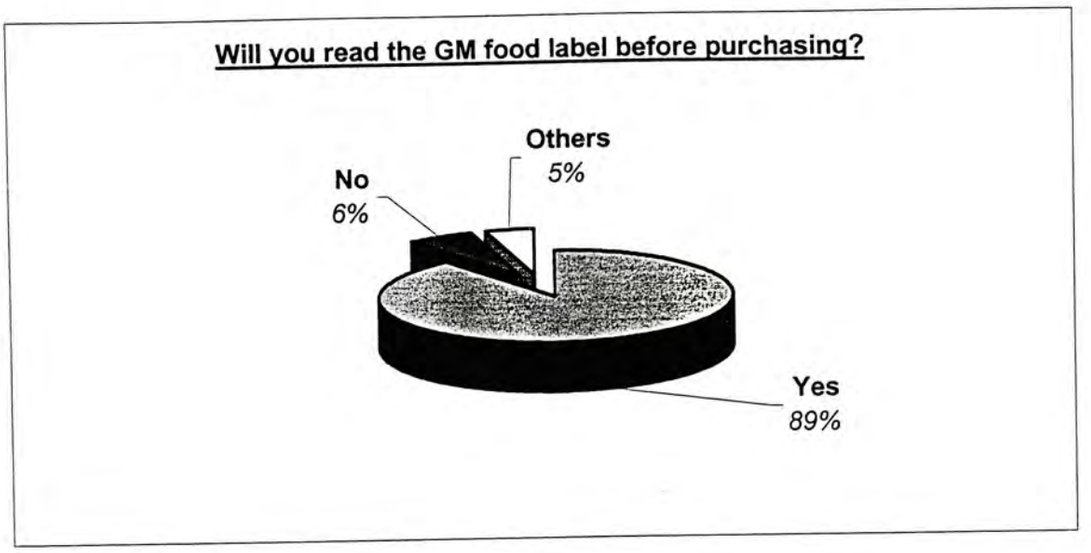
respondents disagreed. In summary, the majority of the general public believes that GM Food Labeling System is useful in helping them to choose which food brand to buy and that consumers had the right to be informed about the presence of GM elements in the food they purchased. This, together with our result, demonstrates the demand for the Government to implement this system.

Fig 21: Percentage of respondents who read the information printed on the label of pre-packaged food



According to Fig 21, 91% of respondents will read the information printed on the label of pre-packaged food. Within the 91%, 35% will read all the information while 56% will read the information they are interested in. 6% commented that they would not read the labels at all. Thus, a large majority of the respondents will read at least some information on the label; therefore, the label is useful for consumers.

Fig 22: Percentage of respondents who will read the GM food label before purchasing



As shown in Fig 22, the majority of respondents (89%) commented that they would read the GM label before purchasing if there was such a label on the food product. Only 6% responded that they would not read the GM label.

Fig 23: Reactions of respondents when there is a new label on the package stating that the product contains GM ingredients

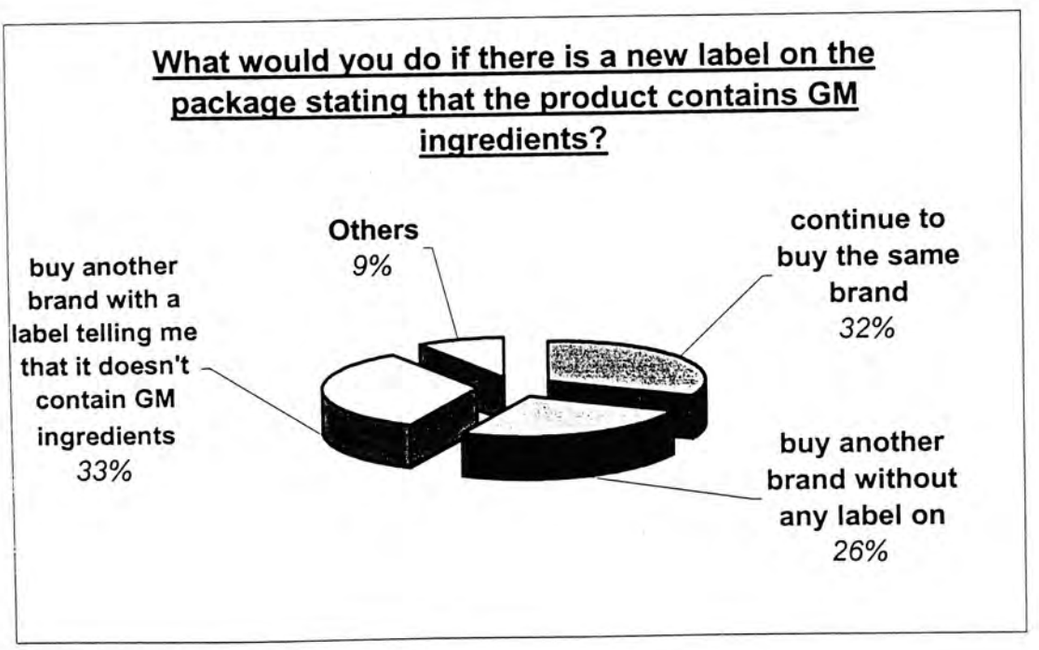


Fig 23 shows that 33% of respondents would buy another brand with a label telling them that the food product they purchased did not contain GM ingredients if there was a new label on the package stating the product contained GM elements. 32% would continue to buy the same brand while 26% would buy another brand without any label. Therefore, the result suggests that more than half (59%) of respondents will switch their choice if they found a label telling them that the food product contains GM ingredients.

Profiles of the Respondents

Fig 24: Age groups of respondents

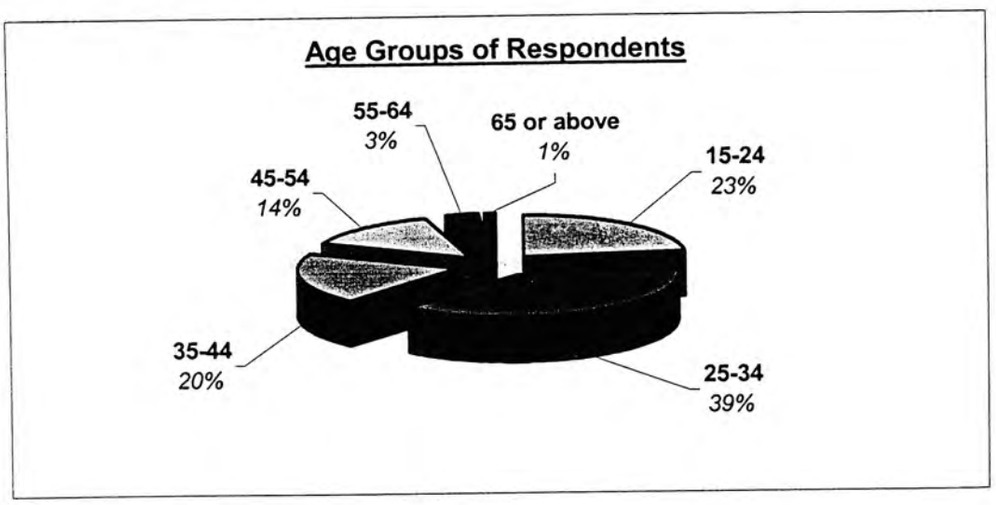
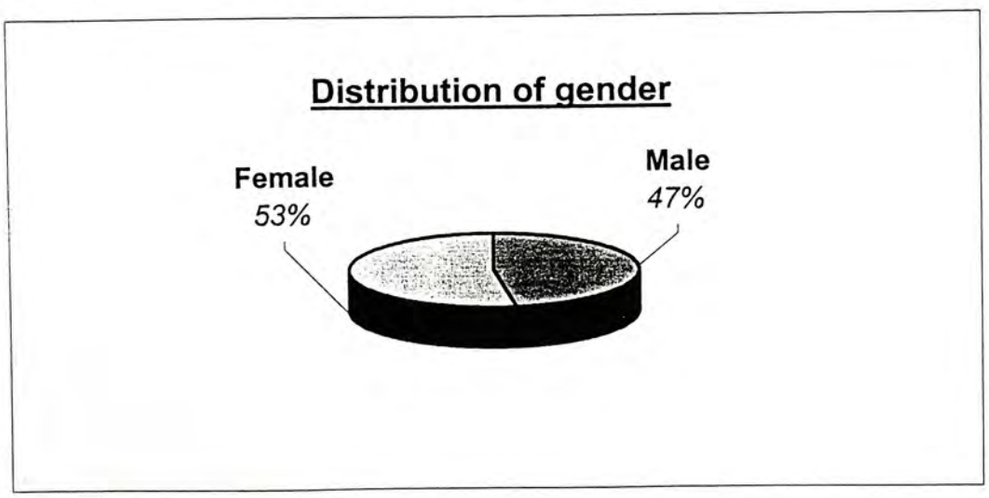


Fig 25: Distribution of gender of the respondents



As shown in Fig 24, the age distribution of the respondents are as follows: 23% are aged 15 – 24; 39% are aged 25 – 34; 20% aged 35 – 44; 14% are aged 45 – 54; 3% are aged 55 – 64; 1% are aged 65 or above. Fig 25 shows that the percentage of female is slightly higher than the percentage of male among the respondent, this is in line with that of Hong Kong's population.

Fig 26: Frequency of shopping in a supermarket/convenience store of respondents

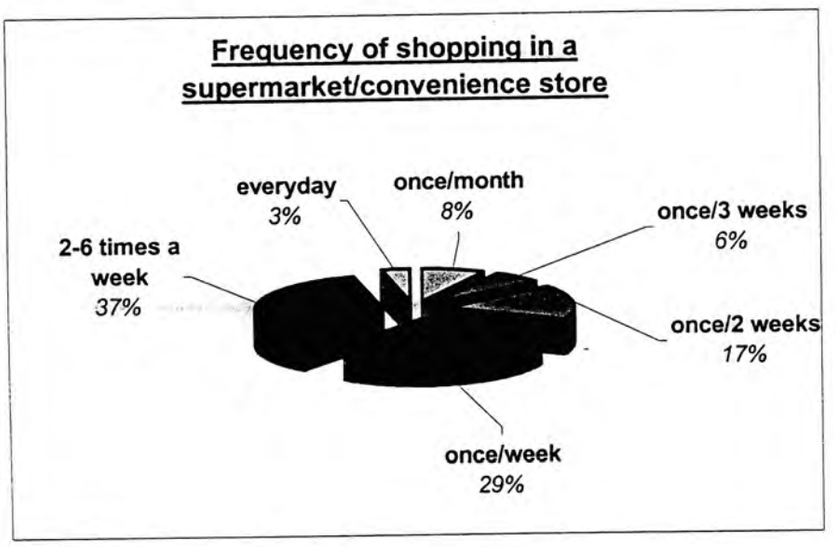


Fig 27: Current status of respondents

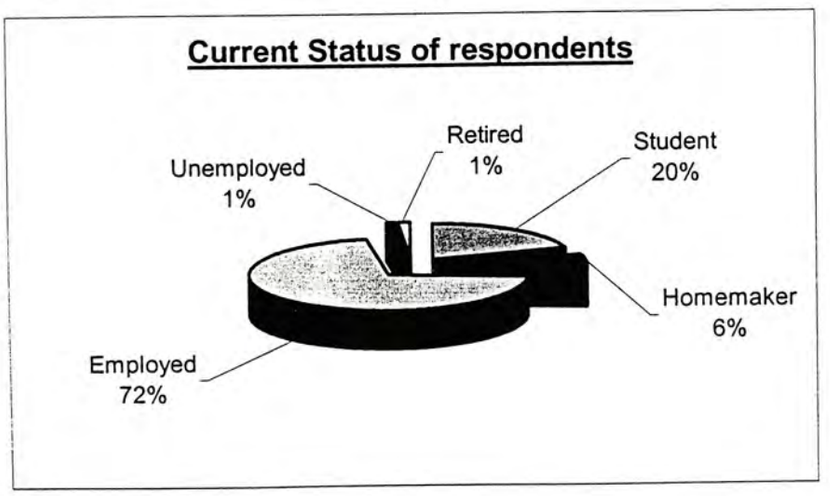


Fig 26 shows the respondents' frequency of grocery shopping. 3% reported that they will shop everyday; 37% reported that they will shop 2 – 6 times a week; 29%

reported that they will shop once per week; 17% reported that they will shop once every 2 weeks; 6% reported that they will shop once every 3 weeks; 8% reported that they will shop once per month or less. Fig 27 shows the current status of the respondents. The majority (72%) of respondents is employed, 20% are students, 6% are homemakers, 1% are unemployed and another 1% are retired.

Fig 28: Highest education level attained of respondents

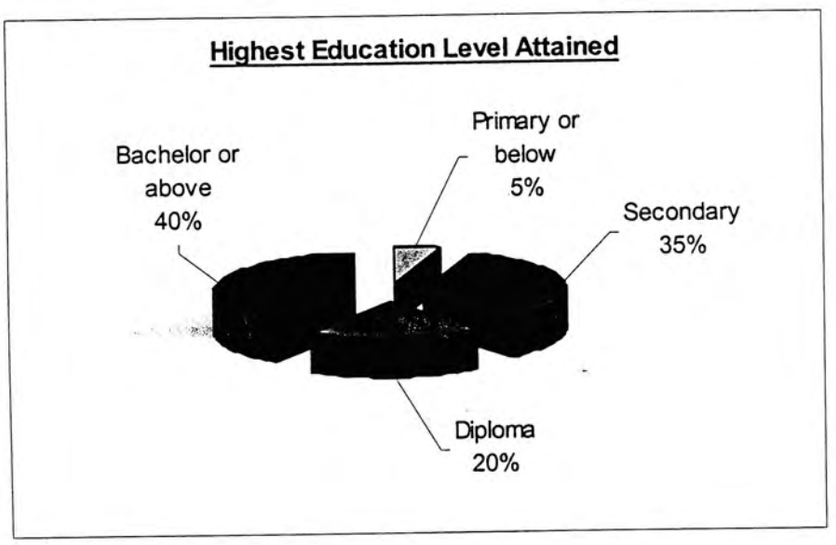


Fig 29: Monthly household income of respondents

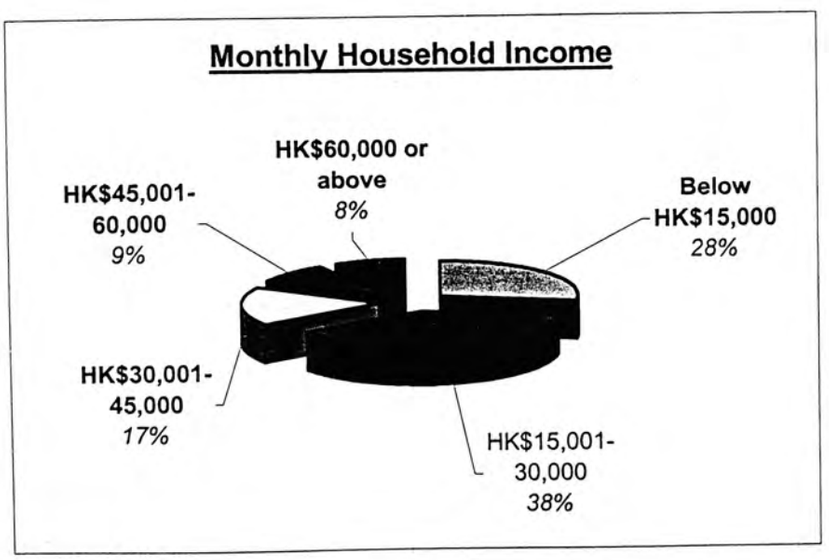


Table 10: Monthly Domestic Household Income of Hong Kong Population in year 2001

Monthly Domestic Household Income (HK$)	Percentage of the Population
Below 15000	41.3%
15000 - 29999	33.8%
30000 - 39999	9.9%
40000 - 59999	8.1%
Above 60000	6.9%

Source: Census and Statistics Department, HKSAR Government

Fig 28 shows the education level of the respondents. 5% had completed primary education or below; 35% had completed secondary education; 20% had completed post-secondary diploma education; 40% had completed tertiary education. Fig 29 shows the monthly household income level for the respondents. 28% had the monthly household income of HK$15000 or below; 38% had the monthly household income of HK$15001 – 30000; 17% had the monthly household income of HK$15001 – 30000; 17% had the monthly household income of HK$30001 – 45000; 9% had the monthly household income of HK$45001 – 60000; 8% had the monthly household income of HK$60000 or above. By comparing this result with that provided by Census and Statistics Hong Kong in 2001 in Table 10, a very close pattern can be observed between the two sets of result. Therefore, it is reasonable to assume that the data obtained from this research study are unbiased statistics and of they are representative for the true population in Hong Kong.

Limitations

Same as other research studies, there are some factors which might have effect the reliability for the results of this study. Firstly of all, since GM food is a relatively new concept to many people in Hong Kong, they might not have a very strong opinion on

the subject. Therefore, when they were asked whether they agree or disagree with a statement relating to certain issue for GM food, their responses might tend to be close to neutral. Also, when the respondents were asked to give a 1 to 6 rating for the quality, nutritional value, price and safety of consumption for both GM food and traditional food, a large proportion of them (about 30 to 40%) actually answered "don't know" for those attributes for GM food. Therefore, the rating resulted for each attribute might not be very accurate. Furthermore, it is unavoidable to have some respondents who might randomly fill in an answer for the questions.

Since both of the English and Chinese versions of the questionnaires were used, problems associated with instrument variation might be present. For instance, there might be slight difference in the exact meaning for some statements between the Chinese and English versions. Therefore, respondents might answer the question differently if another version of the questionnaire was given to them. Lastly, since convenience sampling was used, the samples might be subject to selection bias. For example, certain groups of people like those above 65 years old are underrepresented in the samples in this study.

CHAPTER IV

RECOMMENDATIONS

For Government

As indicated from the research study, the general public's knowledge of GM food is very limited. Also, the factor that most concerned them is the safety of consumption of GM food. A large proportion of respondents agreed that the GM Food Labeling System is helpful, informative, and necessary even if its implementation might lead to a slight increase in the price of the food product. Furthermore, they think that consumers should have the right to know about what is contained in the food they eat. The government should recognize that there is an urgent need to address the concerns of the general public on GM food.

Currently, a number of food manufacturers in Hong Kong argue that the implementation of GM Food Labeling System will cause an increase in the cost of the food prices a reduction in food variety. Consequently, it will put consumers in an unfavorable situation. In contrast, most of the general public and many of the NGOs are in favor of the GM Food Labeling System. In line with the results of this study, consumers think that they should have the right to know about what is contained in the food they eat; also, the labeling system can provide them with the information that

they need for making their purchases of food. In view of the opposition of the different groups in the society, the most ideal solution that the government can provide is to satisfy the need of certain groups while still protect the interest of the others. Therefore, it might be advisable for the government to take set up a standard for the labeling of "non-GM food". For instance, the government could set up guideline / regulation in order to define what it is meant by "non-GM food product." Then, food manufacturers, who did not use any GM ingredients in their food products, can voluntarily put such a label on their food products after their products have passed the tests done by those government certified laboratories. As a result, no mandatory labeling system will be needed to control food manufacturers; on the other hand, consumers can get the information they want and make their choices accordingly.

Also, government should devote more effort in educating the public about the latest development of GM food and in providing updated information for GM food. Furthermore, the government could do more research in this area in order to better manage and handle any problems related to this issue. It should also collaborate with other foreign researchers or professionals who have expertise in this area to gain a better understanding of the current situation. More close attention should be paid by the government to the latest development of international standard for the labeling of GM food. Once a standard is established, it should follow the guideline for the defining GM food. It should then develop its own expertise in identifying the presence of any GM ingredients in all the locally produced and imported food products. Finally, a timescale for the development of the GM food policy should be proposed in order to show that the government is attentive to the general public's concerns.

For GM Food Manufacturers

If the proposed GM Food Labeling System is implemented in Hong Kong, it will definitely have detrimental effects on the competitiveness of those food manufacturers who use GM ingredients. As indicated in this study, almost 60% of respondents reported that they would switch to another brand if they know that the food product they used to buy contained GM ingredients. In order to cope with this situation, food manufacturers should take a precautious step by promoting the benefits of GM food and proving its safety for human consumption. In addition, the result showed that price is also an important factor for people's choice of the food purchased. In view of this, food manufacturers should inform the general public about the cost advantage that can be brought about by the use of GM ingredients. The cost saving can be transferred to the customers by providing them with high quality food at competitive prices.

From this research study, it was found that age and education level are the two major factors which affect people's perception of GM food. The greater the education level completed, the higher their acceptance of GM food. On the other hand, older generation tends to have a less positive perception of GM food in general. Hence, food manufacturers who had used GM ingredients in their food products should provide scientific evidence showing that GM food is safe for human consumption. This could help them to gain the public's confidence in purchasing and consuming GM products. Furthermore, when respondents were asked to give a rating for the four attributes for both GM food and traditionally produced food, a large proportion of them (about 30 – 40%) answered "Don't Know" for the questions. Therefore, food

manufacturers should uncover the mystery of GM food by using simple concepts and wording to educate the general public about the properties of GM food. The more the public learns about GM food, the more likely they will accept it.

In order to build confidence for the customers, GM food manufacturers should be more transparent in releasing the safety test results and the latest development for the GM food they manufactured. By demonstrating that they are socially responsible, food manufacturers should make donations to NGOs or other charitable organizations like food banks so that a good relationship can be established between the two parties. Therefore, they can build a positive image for their companies. Moreover, food manufacturers should invest more in the research and development for the GM food as to improve its quality and safety. Lastly, they could also provide funding for government in the research and development of GM food policy and testings; therefore, the general public might think that GM food manufacturers are willing to keep them inform about the safety of GM food and they are actually acting on the interest of the public's health.

For suppliers

Suppliers should ensure that the genetically modified raw materials they provide for food manufacturers are of high quality and meet with international health and safety standard. Also, they should be responsible for notifying food manufacturers that the raw materials are genetically modified. In addition, details of the genetically modified components should be provided to food manufacturers for reference. Safety

tests should be done for those GM ingredients as to ensure that there is no health hazard for the consumption of the food made with these GM ingredients.

APPENDIX 1

THE MOST COMMON GM FOOD AVAILABLE IN MARKET

Crop	**Main Uses**	**Enhancements**
Corn	Vegetable oil Animal feed Sweeteners Fuel alcohol	Herbicide tolerance* Insect resistance
Canola	Vegetable oil Animal feed	Herbicide tolerance* Oil (fatty acid)
Soybean	Vegetable oil Food products Animal feed	Herbicide tolerance*
Potato	Food products Animal feed	Insect resistance Virus resistance
Squash	Food products Animal feed	Virus resistance
Tomato	Food products	Delayed ripening

APPENDIX 2

MAJOR DIFFERENCES BETWEEN GENETIC MODIFICATION AND TRADITIONAL BREEDING

Genetic Modification	**Traditional Breeding**
- Isolation and transfer of well-defined genes	- Crossing of thousands of genes at one time
- Introduction of desired genes across the species barrier	- Gene transfer usually within species
- Faster; desired changes can be achieved in one generation - Less costly	- More time consuming in the process of natural selection to achieve the desired characteristics - More expensive

APPENDIX 3

SUMMARY OF THE POTENTIAL BENEFITS AND RISKS OF GM FOODS

Potential Benefits of GM Foods	Potential Risks of GM Foods
Increase crop yields and productivity	Unintended modification in neighboring fields due to cross pollination
Increase the tolerance of crops to adverse growing conditions	Disturbing the balance of ecosystems
Produce food with improved nutrition, longer shelf life and better taste	Development of super pests
Improve processing characteristics so as to reduce wastage and costs	Possible health risks and ethical problems (e.g. religious concern)

APPENDIX 4

SUMMARY OF PROS AND CONS OF DIFFERENT LABELING SYSTMES OF GM FOODS

	Labeling for substantially different GM foods	**Labeling of all GM foods**
Pros	- Alerts consumers to special dietary advices - Does not impose significant additional cost to food production - Little international trade implications	- Informs consumers about whether the food contains any GM materials - Enhances surveillance and tracing of GM food
Cons	- Might not address the need of consumers who would like to know whether food contains any GM materials at all, so as to make an informed choice	- Additional costs to the trade and consumers may have to bear the extra cost eventually - Difficult to enforce because of the limitation of detection methods for GM foods
Countries adopting the approach	Canada, USA	European Union, Australia, New Zealand

APPENDIX 5

QUESTIONNAIRE (ENGLISH VERSION)

Hello! We are the MBA students of Chinese University of Hong Kong. We are currently working on our graduation thesis to study the general public's perception on Genetically Modified (GM) Food in Hong Kong. We would highly appreciate it if you could spare just a few minutes of your valuable time to fill in this questionnaire. All the information collected will be kept strictly confidential. Thank you for your participation.

Part A

1. Have you heard about the term "Genetically Modified (GM) Food"?

   ☐ Yes ☐ No

2. Which one of the following best describes yourself for your understanding of the term "Genetically Modified (GM) Food"?

   ☐ I have very good understanding of the term "Genetically Modified (GM) Food"
   ☐ I have good understanding of the term "Genetically Modified (GM) Food"
   ☐ I have sufficient understanding of the term "Genetically Modified (GM) Food"
   ☐ I have some basic understanding of the term "Genetically Modified (GM) Food"
   ☐ I have very little understanding of the term "Genetically Modified (GM) Food"
   ☐ I have no understanding of the term "Genetically Modified (GM) Food"

3. Have you bought any genetically modified (GM) food in the past?

   ☐ Yes ☐ No ☐ Don't know

Part B

1. What do you think about genetically modified (GM) food in general? Please assign a score for the following factors for genetically modified (GM) food. **(1 = Very Poor; 6 = Very Good)**

	Genetically Modified (GM) Food						
	1	2	3	4	5	6	Don't Know
a. Quality	☐	☐	☐	☐	☐	☐	☐
b. Nutritional Value	☐	☐	☐	☐	☐	☐	☐
c. Price	☐	☐	☐	☐	☐	☐	☐
d. Safety of consumption	☐	☐	☐	☐	☐	☐	☐

2. What do you think about traditionally produced food in general? Please assign a score for the following factors for traditionally produced food. **(1 = Very Poor; 6 = Very Good)**

	Traditionally Produced Food						
	1	2	3	4	5	6	Don't Know
a. Quality	☐	☐	☐	☐	☐	☐	☐
b. Nutritional Value	☐	☐	☐	☐	☐	☐	☐
c. Price	☐	☐	☐	☐	☐	☐	☐
d. Safety of consumption	☐	☐	☐	☐	☐	☐	☐

Part C

From a scale of 1 to 6, please rate the extent to which you agree/disagree with the following statements **(1 = Strongly Agree ; 6 = Strongly Disagree)**. Please put an "X" in the appropriate box below each statement.

1. Generally speaking, I do not mind eating genetically modified (GM) food.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

2. Generally speaking, I think genetically modified (GM) food is safe for human consumption.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

3. Generally speaking, I think genetically modified (GM) food is nutritious.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

4. Generally speaking, I do not mind buying genetically modified (GM) food.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

5. Given the same price and quality for 2 food products, I would buy the one that is traditionally produced over the one that is genetically modified (GM).

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

6. Given the same quality for 2 food products, if the price of the genetically modified (GM) product is lower than that of the traditionally produced one, I would buy the genetically modified (GM) one.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

7. Given the same quality for 2 food products, if the price of the genetically modified (GM) product is higher than that of the traditionally produced one, I would buy the genetically modified (GM) one.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

8. Given the same price for 2 food products, if the quality of the genetically modified (GM) product is better than that of the traditionally produced one, I would buy the genetically modified (GM) one.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

Part D

*GM Food Labeling System: a tentative labeling system which suggests food manufacturers, who had used any genetically modified ingredients in their food products, to have a label on the package of their pre-packaged food products indicating that the food products contain GM ingredients.

From a scale of 1 to 6, please rate the extent to which you agree/disagree with the following statements

(**1 = Strongly Agree ; 6 = Strongly Disagree**). Please put an "X" in the appropriate box below each statement.

1. I think the GM Food Labeling System* is useful in helping me to choose which food brand to buy.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

2. I think consumers should have the right to know whether the food they purchased contains any genetically modified (GM) ingredients.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

3. I think it is necessary for the government to implement the GM Food Labeling System*.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

4. I think it is worthwhile for the government to implement the GM Food Labeling System* even if the labeling system would lead to a slight increase in the price of food.

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

5. What is the most important factor for determining your choice of food purchased? (Please check **one answer only**)

☐ Brand of the product

☐ Price

- ☐ Quality
- ☐ Nutritional value
- ☐ Safety of consumption
- ☐ Not genetically modified
- ☐ Others, please specify: ☐

6. If you chose not to buy genetically modified (GM) food under one occasion, what will be your most likely reason for not buying it? (Please check **one answer only**)
   - ☐ Brand of the product
   - ☐ Price
   - ☐ Quality
   - ☐ Nutritional value
   - ☐ Safety of consumption
   - ☐ Environmental or ecological issues
   - ☐ Others, please specify: ☐

7. Do you read the information printed on the label of pre-packaged food?
   - ☐ Yes, I will read everything on the label
   - ☐ Yes, I will read some of the information that I am interested in
   - ☐ No, I will not read the information on the label
   - ☐ It depends → please specify the reasons: ☐

8. If there is a label on the pre-packaged food specifying whether the food product contains genetically modified (GM) ingredients, will you read this label before purchasing the food product?
   - ☐ Yes, I will read the label
   - ☐ No, I will not read the label
   - ☐ It depends → please specify the reasons: ☐

9. If there is a new label on the package of the food product that I used to buy telling me that the product contains genetically modified (GM) ingredients, I will be most likely to:
   - ☐ continue to buy the same brand
   - ☐ buy another brand without any label on it
   - ☐ buy another brand with a label telling me that it does not contain any GM ingredients
   - ☐ Others, please specify: ☐

Part E

1. How old are you?
   - ☐ Below 15
   - ☐ 15 – 24
   - ☐ 25 – 34
   - ☐ 35 – 44
   - ☐ 45 – 54
   - ☐ 55 – 64
   - ☐ 65 or above

2. What is your sex?
   - ☐ Male
   - ☐ Female

3. How often do you shop for food or drinks in a supermarket or convenience store?
   - ☐ Once a month or less
   - ☐ Once every 3 weeks
   - ☐ Once every 2 weeks
   - ☐ Once a week
   - ☐ 2 to 6 times a week
   - ☐ Everyday

4. What is your highest education level attained?
   - ☐ Primary or below
   - ☐ Secondary
   - ☐ Diploma
   - ☐ Bachelor or above
   - ☐ Others, please specify: ☐

5. What is your current status?
   - ☐ Student
   - ☐ Homemaker
   - ☐ Employed
   - ☐ Unemployed
   - ☐ Retired
   - ☐ Others, please specify: ☐

6. What is your monthly household income?
   - ☐ HK$15,000 or below
   - ☐ HK$15,001 – 30,000
   - ☐ HK$30,001 – 45,000
   - ☐ HK$45,001 – 60,000
   - ☐ HK$60,001 or above

APPENDIX 6

QUESTIONNAIRE (CHINESE VERSION)

您好! 我們是香港中文大學工商管理碩士學生, 我們正在爲我們的畢業論文收集有關香港大眾市民對基因改造食品的意見。你們的意見和個人資料, 會絕對保密。非常感謝你們抽出寶貴的時間爲我們填寫以下問卷。

第一節

1. 有否聽聞過"基因改造食品"?
   ☐ 有 ☐ 否

2. 以下哪項最佳形容你對基因改造食品的認識?
   ☐ 我對基因改造食品有非常深厚的認識
   ☐ 我對基因改造食品有良好的認識
   ☐ 我對基因改造食品有足夠的認識
   ☐ 我對基因改造食品有基本的認識
   ☐ 我對基因改造食品有很少的認識
   ☐ 我對基因改造食品沒有任何認識

3. 有否購買過基因改造食品?
   ☐ 有 ☐ 否 ☐不知

第二節

1. 請問你對基因改造食品有何意見? 請爲以下每項評分(1=非常不好; 6=非常好)

	基因改造食品						
	1	2	3	4	5	6	不知
a. 品質	☐	☐	☐	☐	☐	☐	☐
b. 營養價值	☐	☐	☐	☐	☐	☐	☐
c. 價錢	☐	☐	☐	☐	☐	☐	☐
d. 安全供人食用	☐	☐	☐	☐	☐	☐	☐

2. 請問你對傳統食品有何意見? 請爲以下每項評分(1=非常不好; 6=非常好)

	傳統食品						
	1	2	3	4	5	6	不知
a. 品質	☐	☐	☐	☐	☐	☐	☐
b. 營養價值	☐	☐	☐	☐	☐	☐	☐
c. 價錢	☐	☐	☐	☐	☐	☐	☐
d. 安全供人食用	☐	☐	☐	☐	☐	☐	☐

第三節

以 1-6 爲標準, 請你選擇出以下哪項最佳形容你的意見
(1=非常同意; 6=非常不同意) 請在有關方格加上"√"

1. 總括來說, 我不介意食用基因改造食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

2. 總括來說, 我認爲基因改造食品安全, 宜供人食用

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

3. 總括來說, 我認爲基因改造食品有營養價值

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

4. 總括來說, 我不介意購買基因改造食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

5. 如果有兩件價錢與品質一樣的食品, 我會選擇同類的傳統食品多於基因改造食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

6. 如果有兩件品質一樣的食品, 而基因改造食品較同類的傳統食品便宜, 我會選擇價錢較平的基因改造食品多於同類的傳統食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

7. 如果有兩件品質一樣的食品, 而基因改造食品較同類的傳統食品貴, 我會選擇價錢較貴的基因改造食品多於同類的傳統食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

8. 如果有兩件價錢一樣的食品, 而基因改造食品較同類的傳統食品有更高品質, 我會選擇基因改造食品多於同類的傳統食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

第四節

*基因改造食品標籤: 香港正擬訂制基因改造食品標籤, 食品生產商/食物業須爲預先包裝食品或其他種類含基因改造成分的食品加上標籤，向消費者提供更多這方面的資料

(1=非常同意; 6=非常不同意) 請在有關方格加上"√"

1. 我認爲基因改造食品標籤*可以爲我提供有關資料讓我選擇購買哪一品牌的食品

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

2. 我認爲消費者有權知道有關購買的食品有否含有基因改造成分的資料

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

3. 我認爲香港政府應該實施基因改造食品標籤制度*

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

4. 即使實施基因改造食品標籤制度*會略爲增加食品價錢, 我亦認爲值得

1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

5. 以下哪項是你購買食品最重要的因素? (請選擇**一個答案**)
   - ☐ 食品品牌
   - ☐ 價錢
   - ☐ 品質
   - ☐ 營養價值
   - ☐ 食品的安全
   - ☐ 食品不含基因改造成分
   - ☐ 其他, 請註明: ☐

6. 如果你在某些情況下選擇不購買基因改造食品,以下哪項是你不購買基因改造食品最主要的因素? (請選擇**一個答案**)
   - ☐ 食品品牌
   - ☐ 價錢
   - ☐ 品質
   - ☐ 營養價值
   - ☐ 食品的安全
   - ☐ 環境與生態問題
   - ☐ 其他, 請註明: ☐

7. 你會不會閱讀在食品標籤上的資料?
   - ☐ 我會閱讀全部在食品標籤上的資料
   - ☐ 我會閱讀在食品標籤上我有興趣的資料
   - ☐ 我不會閱讀在食品標籤上的資料
   - ☐ 視情況, 請註明: ☐

8. 如果購買的食品加上基因改造食品標籤, 提供有關該食品有否含基因改造成分資料, 你會否閱讀標籤上的資料才購買?
   - ☐ 我會閱讀食品標籤
   - ☐ 我不會閱讀食品標籤
   - ☐ 視情況, 請註明: ☐

9. 如果我經常購買的食品加上食品標籤, 提供有關資料說明該食品含基因改造成分, 我最可能會:
   - ☐ 繼續購買該品牌的食品
   - ☐ 購買其他不含基因改造食品標籤品牌的食品
   - ☐ 購買其他有食品標籤指出不含基因改造成分的食品品牌
   - ☐ 其他, 請註明: ☐

<u>第五節</u>

1. 你的年齡
   - ☐ 15 以下
   - ☐ 15 – 24
   - ☐ 25 – 34
   - ☐ 35 – 44
   - ☐ 45 – 54
   - ☐ 55 – 64
   - ☐ 65 或以上

2. 你的性別:
   - ☐ 男
   - ☐ 女

3. 你有多常往超級市場/便利購買食品/飲料
   - ☐ 一個月一次或以下
   - ☐ 三星期一次
   - ☐ 兩星期一次
   - ☐ 一星期一次
   - ☐ 一星期二次至六次
   - ☐ 每天一次或以上

4. 你最高的教育程度
   - ☐ 小學程度或以下
   - ☐ 中學程度
   - ☐ 文憑
   - ☐ 學士學位或以上
   - ☐ 其他, 請註明: ☐

5. 你的現況?
   - ☐ 學生
   - ☐ 主婦
   - ☐ 在職
   - ☐ 失業
   - ☐ 退休
   - ☐ 其他, 請註明: ☐

6. 你的每月家庭入息?
   - ☐ HK$15,000 或以下
   - ☐ HK$15,001 – 30,000
   - ☐ HK$30,001 – 45,000
   - ☐ HK$45,001 – 60,000
   - ☐ HK$60,001 或以上

~THANK YOU~ 非常感謝

TABLE A1: STATUS OF NATIONAL RULES FOR LABELING GM FOODS

States	Labels	Coverage	Effective Date
Australasia			
Australia & New Zealand	M	GM content in processed foods, fruits, vegetables; 1% tolerance.	December 2001
Asia			
China	M	All foods containing GM content.	May 23 2001
Hong Kong	V/M	All foods containing GM content; 5% tolerance.	Estimated 2003
Indonesia	M	Article 41, Provisions on Biosafety of Genetically Engineered Agricultural Biotechnology Products, requires labels.	NA
Japan	M	MAFF regulations exempt additives, animal feeds, and any ingredient representing less than 5% of content.	April 1 2001
Russia	V	Decree No. 12 (1999) refers to labeling of GMOs.	NA
South Korea	M	Processed foods with GM corn, soybean or bean sprouts (and potatoes in 2002); if one of top 5 ingredients; 3% tolerance.	March 1 2001
Taiwan	M	Processed foods containing GM corn or soybeans; 5% tolerance.	By 2005
Sri Lanka	B	Currently ban production or imports of GM products.	Ongoing
Thailand	M	GM content in all foods and raw products; 3% or 5% tolerance.	End 2001
Africa			
Ethiopia	M	All products.	NA
South Africa	M	New law proposed.	2002
Europe (National)			
Austria	M	Prefer a ban on GM foods rather than labels.	NA
Czech Republic	M	All products of GM origin or ingredient.	NA
France, Ireland, Spain	M	Want to label GM additives and preservatives.	NA
Hungary	M	Products containing/derived from GM material (excluding feed and novel food).	NA
Netherlands	M	Propose mandatory labeling for animal feed.	NA
Poland	M	Conform to EC 219/90 and 220/90.	NA
Slovenia	M	Conform to EC 219/90 and 220/90.	NA
Switzerland	M	Conforming to EC 219/90 and 220/90.	NA
United Kingdom	M	Grocery store and restaurant foods on sale in UK before September 1, 1998; not for additives/flavorings/food.	March 1 1999
European Union	M	Dir. 90/220: law requiring labeling of all foods and food products containing GMOs; no tolerances set.	1990
	M	Reg. 258/97: 1% tolerances; mandatory labeling of foods; no regulation for chymosin, additives or feeds.	May 15 1997
	M	Reg. 1139/98: specific rules for GM soy and maize.	May 26 1998
North & South America			
Argentina	V	No required labels; voluntary labels allowed.	Ongoing
Brazil	B/M	Ban currently in force; propose labels for products containing more than 4% GM content.	End 2001
Canada	V	Voluntary standards being developed; labels not used in interim.	2001 or beyond
Mexico	M	Senate has approved a bill for GM foods to be labeled as "transgenic" or "made with transgenic products."	NA
United States	V	GM food must be "substantially equivalent" food; exporters will meet EU standards.	2001

Note. B = Ban on GM products; M = Mandatory Labeling; V = Voluntary Labeling.

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